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THE PAPER INDUSTRY

The Monthly Educational Journal of the Paper Industry.

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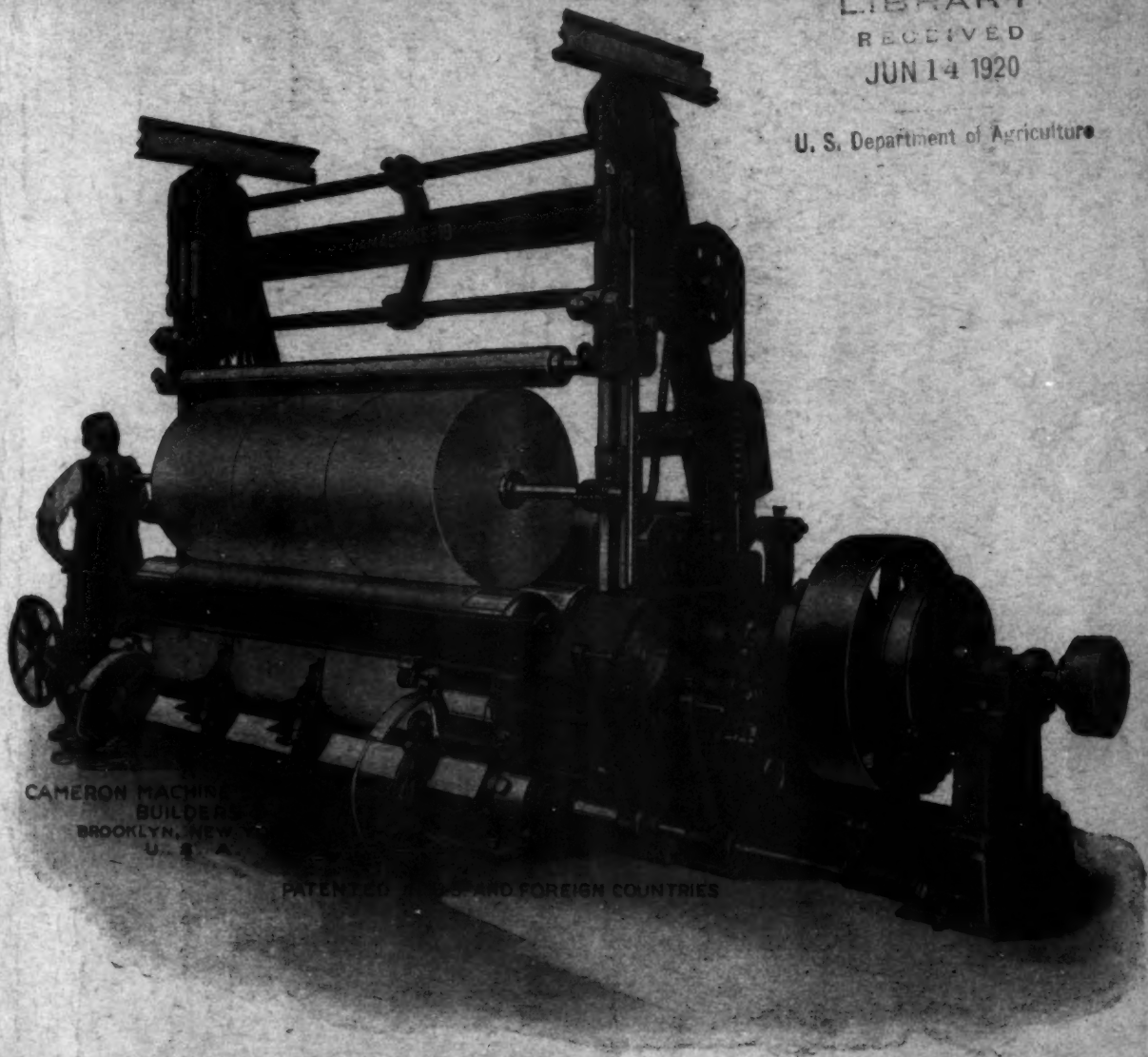

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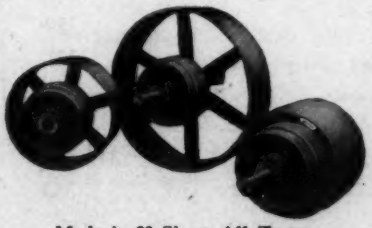

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Vol. 2—No. 2

THE PAPER INDUSTRY

A. SCOTT DOWD
Editor

A MONTHLY EDUCATIONAL JOURNAL
Devoted to the Interests of The Paper Industry

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EDITORIAL

The Birth and Growth of an Idea

THE development of an idea is always interesting, while distance lends a certain amount of enchantment, as the strenuous experience that comes into the pioneer's path melt into achievement. Profitable ideas are not born of wrong impulses. How often do we see a going industry or a successful organization without realizing that the birth of that particular result cost some one many hours of patient effort, and, doubtless, many a moment of uncertainty, discouragement, and perhaps despair when the grade seemed too steep to climb. Only he who bore the burden in the race at the start of a movement can fully understand the stress of events which its success represents.

The Paper Industry was not hatched from a serpent's egg. It was not a promoter's effort at jobbing watered stock, or getting a lot of money in whatever way might seem easiest. In fact, there was no thought of making a lot of money. It was not an effort to put something over. It was an honest endeavor to be of service to an industry in which the writer had been interested for many years. It is given to every man to know his own heart, be his capacity what it may, and every man knows whether he is honestly standing on his own feet or seeking the sponge path, to turn to his own account what another has labored to establish.

For some twenty-eight years, the publisher of The Paper Industry has traveled among the paper mills of this country. Of necessity, he grew familiar with the demands of the trade. The gradual effect of this was to create in his mind an honest desire to help meet some of the needs apparent to any man whose aim was Service above Self. He saw the need of a journal different from those in the field. He felt that he knew the right kind of a paper, and simply waited for an opportunity to bring his desire into active operation. The outline for action grew up in his thought which included three steps: first, the monthly educational journal; second, to get the superintendents into an organization whereby they might come together and learn from one another, a real educational and helpful institution, and then later a third step.

It is one thing to see the top of a mountain and quite another to climb the steep ascent. Years passed before the right opportunity came to launch the project. Many helpful hints were gleaned here and there through conversation with those interested in thinking uphill to better things. Early in 1919, a climax of conditions seemed to indicate that the time was ripe for carrying out the long cherished plan, and arrangements were made to go ahead with the issue of the paper. It was not a very complete edition that at first appeared, but the publisher's motive was simply to be of service, and whatever growth has come to this periodical has come due to an honest intent to give value received. If we have any measure of pride in our success, it is not because of financial gain, since

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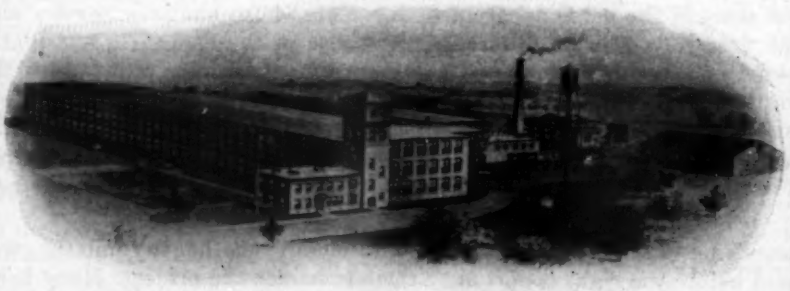

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this has yet to appear, but we are grateful for appreciated effort shown by those able to judge of honest merit.

There have been men so grasping after the dollar that the prayer of their heart might be said to be voiced in these lines—

Almighty dollar, thy shining face,
Bespeaks thy wondrous power;
My pocket be thy resting place,
I need thee every hour.

We remember a man in an eastern city with a mind so warped that he would go about eating out of garbage cans that he might hoard his money. This seems unthinkable, yet what shall we say of the man whose lust for dollars and power leads him to covet the fruit of another man's labor? Honest men must ever look in withering pity on the poor creatures that bite at the hand which only seeks to do men good.

The idea of the American Paper & Pulp Mill Superintendents' Association, though not so old as that of the Paper Industry—and this name for the publication was chosen for a purpose, and not only to give it a name—grew to be parallel with it, as an instrument of helpful activity. The first editor of The Paper Industry came to his work, not a paper man, but a printer. We are grateful for whatever of mutual good came from his association with our office. A right idea, like a kernel of corn, contains all that is necessary for its unfoldment, while a wrong notion sinks by its own weight. It should be the proud thought of every man working in the paper industry that ours is one of the fundamental activities of this country, one of the biggest and best industries, and in the filling of its place, the interests of all are identical, whether owners, executive, superintendent, or laborer.

When the superintendents' association was formed, its animus was the growth of a sincere desire to help. Appleton seemed to be the right place for the first meeting. At any rate, it was there, in June, 1919, that the writer was privileged to call the superintendents together and organize the association which had long existed only as a vision in his own mind. Irresponsible interests are sure to seek the manipulation and control of this organization, as has been done before, as selfishness is always sure to seek its own, but if SERVICE be kept uppermost in the minds of those in the association, detection of any dishonest element will be easy.

A man is not necessarily responsible for his lack of capacity, nor is credit due him for talents bestowed by a power above himself, but every man is responsible for his integrity and the measure of his humanity. To be able to sign himself "Yours sincerely" to all alike is worth while, and with an "Open Hand" it is our desire to work straight to that point.

One man said to another, "What you are speaks so loud I can't hear what you say," while still another has said, "What you are when you are alone, that's what you are." The superintendents' association was not born in the breast of mad ambition. The constant expense of organization, correspondence, traveling, time, railroad fare, and many other items, all of which were borne from the same pocketbook, were not kept account of, nor tabulated to weigh against the progress of its helpfulness. It was then only natural that The Paper Industry was chosen as the official organ. It was only natural then that the man who was editor of the association, whoever this might be, was chosen as secretary of the association, by virtue of his position with the paper. He, as no other man, could know the financial struggle which had been necessary to keep the idea growing. He knew

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where all the financial support came from, and he also knew that neither he, nor any other man, put a cent into the organization to stand the early burdens. That he later saw fit to return to his post as printer was undoubtedly wise, though he should at the same time have given up his connection with the association, and he has our best expectancy for honest success in the line of his capacity. The present editor comes to his work with the zest of a high desire and a foundation of long experience.

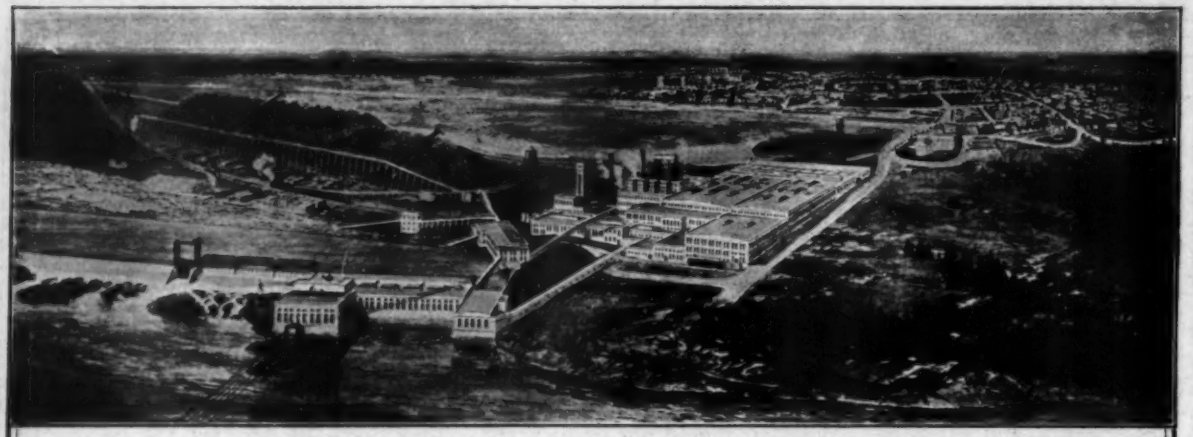
If the superintendents' association is to grow strong in service, it must stand solid upon merit. Get rich schemes have no part in its history and should have no part in its development. There is plenty of room in this wide world for the constructive effort of every man. Honest value wrongs no man. Legitimate dues should care for legitimate debts, and any other obligation should not be incurred. They open the way for the despoiler. Meteoric propositions for "easy money" may look well, but they leave a bad taste in the mouth that no association can afford to have follow in its train.

All of the associations connected with the paper industry are to be congratulated from the fact that they have been under the management of men of high character and ability, and have grown to great usefulness for this reason. This is particularly true of the Technical Association, and now the Salesmen's Association has been launched with a man at its head who we are sure would not stand for one moment for anything that savored of anything except high ideals. We care not who are the officers of the superintendents' association, but as ours was the burden, when there was a burden to carry, we do want to see that men are at the head of it whose ideas will be for service, and not for self. Right alone wins the day, and as we have only the fairest expectancy for every man who is willing to stand upon his own feet, we have a right to receive the same in return. Personal power is only a myth.

Everybody likes to go to a fire, but not every one cares to pull the apparatus through the mud. We have received nothing and want nothing from this, or any other association, except to be of honest service, for all associations that are working for good must look alike to us: The Paper Industry was not started to help just one set of men or any one association more than another. As certain elements in this association, however, are not only trying to control but have gotten the insane idea that they are the cause for the growth of The Paper Industry, most of whom have not so far as subscribed for the paper, but have gone so far as to suggest that this property should be divided up among them, or else they would do what they could to destroy it, and start another journal in opposition, not caring whether it was needed or not, but simply to rule or ruin, we think it is time that when the meeting occurs in Buffalo in June that the members see to it that men are elected for the coming year that think more of the association than of self. The association is full of big, honest men. The eyes of envy always lust toward a success, though men with these desires never start anything, but try to grab it off after the hard work and expense has been borne by another. There is an uncomfortable hour awaiting the man or men who think to enrich themselves by feeding off the ideas of another's earnest effort, while spreading hate and contention in the midst of concord and sincere endeavor.

The Paper Industry has a reason for its hope that the real thinkers of the association will see that Service is kept as the watchword high above self-interest. It is our desire to aid in whatever way we may, and to this end we have a weather eye upon the wolf.

EDWARD B. FRITZ.



Panorama of the Abitibi Power and Paper Co., Iroquois Falls, Canada. One of the most modern and best plants of its kind in the world.

A Record Repeat Order for Farnsworth Systems

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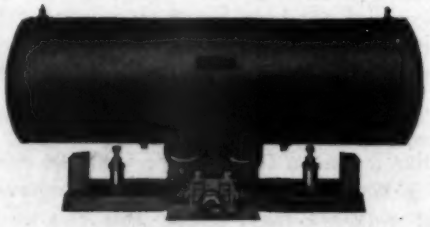
Confidence in the Farnsworth Forced Steam Circulation System and our ability to do what we claim for our systems in paper mills, textile mills, oil refineries, laundries, in fact, in all plants using steam for heating or drying, resulted in this big paper mill placing a record repeat order with us to equip seven large paper machines. Two years ago they placed their first order for our equipment. Today we take pride in the confidence they have shown in us to produce the desired result in their wonderful large and thoroughly up-to-date mill by installing our equipment. Repeat orders are indeed gratifying.

The Sign of Coal Saving



Farnsworth Company, Conshohocken, Pa., U. S. A.
Canadian-Farnsworth Company, Toronto, Canada

A Stagnant Paper Market

"STAGNATION"! That is the word that describes the situation in the paper market today —stagnation due to decreased transportation facilities.

From all portions of the paper producing centers come reports of increased problems surrounding the obtaining of raw materials and supplies necessary to the production of paper at the mills, and from jobbing centers continuous complaints regarding the shipment of paper from the mills and the abnormal delays of delivery of same after shipment.

But it is not alone from the paper industry that these complaints find acute expression. Commodities of all kinds are being more and more tied up.

The Northwest complains of wealth being "stalled" back in the country, unable to get to market because of lack of cars, motive power and loyal labor to handle it.

The Southwest is in the same condition. Wealth is "stalled" at the coal, iron and copper mines.

Vast quantities of fabricated commodities are "stalled" in cars literally buried on congested and clogged side tracks, junction points and terminals far from delivery points.

Enormous financial credits are thus tied up indefinitely by this "stalled-wealth" condition. These moneys and credits are taken out of active circulation; they are useless, functionless, and grown already to so grave proportions as to cause the banking systems of the country to refuse additional credits until the congestion is relieved.

Every additional car of commodities loaded now and placed on rails not only increases the volume of congestion on the railroads, but also "stalls" in immobile form additional financial credits, which cannot be allowed to increase further without danger of a financial tie up.

A financial and a transportation tie up coming concurrently, as looks likely at the present writing, would indeed jar the prosperity era in these United States rather drastically.

We are writing of this acute, abnormal, unprecedented, and from some angles senseless situation dispassionately and coolly, with the idea of dealing with the facts only, but the situation really calls for treatment of the cave man variety.

The business interests of the country have allowed the transportation systems, so vital to the business life of the country, to become the football in politics for the benefit solely of political and radical agitators and demagogues.

The result is that the rank and file of railway men have been underpaid, thus forcing them to strike and tie up transportation in order to force the business public to recognize their just claims. Labor must be properly and justly recompensed, whether in public or private employment.

Then the railroads have been placed before the public in so black a light by the same demagogic agencies that there has been a disposition to penalize them by refusing any increase in their earning by way of increased freight tariffs. The result we now have before us—lack of cars by the hundred thousands, lack of locomotives by the tens of thousands, lack of tracks, terminals and every description of equipment, with which to move and normally circulate the enormously growing traffic.

The railways have no money, no particular amount of credit, and the financial situation is against them.

What's needed?

For the railroad managements, the railroad employes, and the public, or organized commercial interest of the country, to get together and all join in combined demand for increased freight rates and revenue to the roads, so that the railway laborer can receive adequate and just compensation, the commerce and industry of the country adequate and facile service, and the railway owners fair and just treatment by their employes and the public and such returns on their investment as any other investor in any other line of business has a right to expect.

Which will it be? Will the railways, the railway employes, and the public recognize their interdependence upon each other and, quitting their internecine war, get together and cooperate like sane, sensible men or bodies of men in the interest of all; or will they continue this stupid situation until a national disaster in the form of a transportation and financial collapse overtakes us, costing the country more money than the war did?

This stagnation is the calm before the storm. The clouds are gathering for a bad bust daily. Combined action by all concerned in rehabilitation of railway systems of this country will avert a disastrous break.

The American Pulp and Paper Association should be convened at once in extraordinary session, the transportation situation visualized and the leadership in a nation-wide campaign for the salvation of our American railway systems inaugurated. Some national body of sane men must start the campaign and issue the call to all the allied and other industries to line up with us also. Nobody else has yet moved in this crisis. Let us Pulp and Paper men act. To act is to live. To sit is to stagnate. Let's act.

A. B. C. Paper Drying System in Use at River Raisin Paper Co., Monroe, Mich.

For Absorbing Vapor

ONE of the big problems in any paper mill, the absorption of vapor, may be solved quickly and satisfactorily by the use of Sirocco equipment. Warm dry air is blown from heater coils through air ducts directly on to the rolls, absorbing the vapor which otherwise rises and condenses on walls and ceilings.

Today such a system is of greater importance than ever before. Better working conditions and a better product are the results. If you are interested in an absorption system for your mill we would be glad to give you definite information on A. B. C. installations now in use.

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Fire Protection of Log Piles

By F. J. HOXIE

The problems of protecting the pulpwood piles from fire and at the same time avoiding the deteriorating effects upon them from fungus growth are treated carefully in the following article.—Editor.

LOG pile fires occur when the outside of the piles are dry. Most of them have taken place in summer. In cold climates there have been a few large winter fires. The dry atmosphere and snow keep exposed, vertical piles, in these climates, dry in winter. Most of the large losses have been in August.

Dry punk wood is doubtless the chief source of fires in log piles. This light rotted wood when thoroughly dry can be ignited by the smallest spark, and will burn with the utmost persistency.

Dry pulp wood can be most practically obtained by piling in low, well separated piles which can be effectively protected against fire by hose streams. Where wet wood can be used, the entire pile can be kept wet, and, thereby, greater uniformity secured, fires prevented and rotting reduced. Wood rots "between wind and water" is a matter of common knowledge, illustrated by the fence post, which rots first at the surface of the ground where the moisture is most favorable for fungus growth. In order to make practical use of this peculiarity, it will be necessary to determine definitely the moisture limits of the three or four varieties of common fungi which destroy pulp wood as well as roof planks and structural timber.

First Principles of Fire Protection

There are three grand divisions in the efficient control of fires. Prevention is the first and most important, although the least spectacular; methods of extinguishing are second. These have been given most attention by fire protection engineers because of their more conspicuous praticability; the separation of values into parcels of amounts reasonable to risk a total loss, even when such a loss is improbable with the means at hand, is the third, and is governed to a considerable extent by the prevention and protection available.

When factories were insured with only hose stream protection, prevention was by far the most important factor in fire protection engineering. Fire extinguishing was more a matter of chance than an exact science. When automatic sprinklers were introduced, this chance was greatly decreased by making it more certain to extinguish a fire in its early stages and preventing small fires from becoming large ones. The automatic feature also considerably compensated for defects in fire prevention methods. The reliability of the automatic protection immediately gave it paramount importance. It reduced the uncertainty due to the personal element ever present in fire protection, depending on carefulness and good judgment.

The success of the automatic sprinkler is the result of its being able to quickly and automatically extinguish a small fire with a comparatively small amount of water. There are but few mills at the present time which have a sufficient water supply to successfully extinguish the entire structure should it all become ignited at the same time.

Velocity of Combustion Determine the Necessary Water Supply

The velocity of combustion is the factor which determines the water supply necessary to extinguish a fire. A gallon of water can absorb about 9,000 British thermal units, and, therefore, if heat is being generated at the point where this gallon of water is applied at a rate much greater than 9,000 British thermal units during the time the water is applied, there will be little hopes of extinguishing the fire, unless the water can be so applied at the seat of combustion as to reduce the temperature below that at which wood can rapidly combine with oxygen.

The combustion of wood takes place in two stages. The first is destructive distillation such as takes place in a charcoal kiln; the wood is separated by heat into combustible gases and charcoal. The gases burn in the air above the wood and form the luminous flame characteristic of fire. The charcoal burns by combining with oxygen in the original location of the wood forming an intensely hot and luminous bed of coals. The heat from both burning gases and charcoal distills more wood and increases both the temperature and rate of combustion, the increasing velocity of combustion being only limited by the rate at which air can be brought into contact with the burning wood, in the same way that the temperature of a house in winter is regulated by limiting the air supplied to the burning fuel in the furnace by means of the drafts or dampers.

The velocity of combustion of a log pile will at first rapidly increase with the temperature. The temperature accelerating the rate of combustion and increasing the air supply by the increasing upward velocity of the column of hot gases, finally coming to equilibrium at a point at which air cannot be supplied or products of combustion removed any faster.

There are two possible means of reducing the

FIG. 1 EARLY STAGES OF LOG PILE FIRE. NOTE ACTION OF UPDRAFT ON HOSE STREAMS.

FIG. 2 PUNK WOOD LOG IN PULP PILE.

FIG. 3 GRATED PUNK WOOD UNDER CONVEYOR.

FIG. 4 ROTTEN HEARTED SPRUCE LOGS CULLED OUT AT THE WOOD ROOM.

FIG. 5 HOLLOW ROTTEN HEARTED LOG NEAR RAILROAD

FIG. 6 SAP ROTTED LOGS NEAR RAILROAD CAN EASILY IGNITE THE PILE.

FIG. 7 LARGE LOG PILE NEARLY BURNED OUT. NOTE CENTRAL CRATER

FIG. 8 LOG PILES 100 FEET HIGH. AVERAGE MOISTURE IN CENTER 50%

rate of combustion. First, by reducing the temperature; second, by shutting off the draft. The first is that commonly used in fire fighting and consists of putting water on the hot coals, thereby reducing the temperature below that at which destructive distillation can take place. In order to accomplish this end with the smallest possible amount of water, the water must be applied to the hot coals at the base of the fire, not to the flames which are the buring gases, as it frequently done. Figure 1.

It is a matter of considerable difficulty to get water to the seat of combustion against the strong upward force of the column of hot gases. It is impracticable to apply it from the bottom or sides in the direction of the incoming cold air, due to the wood on the outside of the pile, which acts like a grate, admitting air to the burning wood on the interior through the spaces between the logs. Therefore, the fire, once under way, can only be fought with reasonable chance of success by applying large solid hose streams from above with sufficient force to overcome the upward force of the rapidly ascending column of gases. If the water is thrown up onto the pile from the ground (see Fig. 1), it may come to rest in the air directly in the column of ascending gases, and, thereby, it can be carried aside by horizontal air currents and will not reach the base of the fire where it could exert its greatest extinguishing power.

If more pressure is applied to the hose streams, it will cause them to spray and offer greater surface to the buoying action of the ascending gases. The rate of combustion would be expected to increase very rapidly at first and become nearly constant when the air supply has come to equilibrium, in the same manner that the fire under a boiler or in a stove burns for hours at a practically uniform rate when the drafts are regulated. Finally, when the fuel supply is nearly exhausted, the rate of combustion rapidly decreases. Therefore, we should expect a large conical log pile to burn at a practically uniform rate for a considerable period, and the combustion would take place within a comparatively small area, due to the concentration of the fuel; therefore, it would be necessary during this period to apply water in sufficient quantity to absorb the heat faster than it is generated in order to extinguish the fire.

An idea of the amount of water which would be required can be obtained from the following table, in which the velocity of combustion of several of the more important log pile fires has been calculated from the fire reports, and opposite this has been placed the amount of water available as near as could be estimated. Twenty-five hundred pounds of dry wood to the cord is taken as an average figure, and the heat equivalent of dry wood as 7,000 British thermal units to the pound.

Each pound of wood will require approximately a gallon of water to absorb all of the heat generated. That this is supported by experience is shown by the fact that, when the rate of burning is much in excess of this, the fire is not extinguished until practically all of the wood is consumed. Another factor worth noting is the rather constant velocity of about 25,000 pounds of wood per minute at which the larger conical wood piles have burned, showing that, in the larger fires, the period of constant velocity due to draft equilibrium occupies nearly the entire time of the fire.

Velocity of Combustion of Log Piles and Water Supply Available.

Date.	Direction of wind.	Cause.	Hose streams.	Hours time.	Lbs. of wood burned per minute.		Gals. of water per minute.
6/13/00	S.W.	Exposure	7	20	*4,000	e.	2,000
5/ 5/03		Conveyor	5	6	80	e.	1,500
5/13/08	N.W.	Unknown	9	13	1,200	e.	2,000
5/14/10	E.	Locomotive	7	8	2,100	e.	2,000
6/ 4/18	S.W.	Unknown	15	27	14,000	c.	3,500
8/ 4/18	S.W.	Conveyor	14	36	28,000	c.	3,500
8/11/19	N.W.	Locomotive	22	13	25,000	c.	3,000
8/19/16	S.W.	Forest fire	..	60	17,000	c.	....

e. extinguished.
c. consumed.
*Low flat piles.

From the above figures, it is apparent that, if the rate of combustion at the fire of August 11, 1919, had been uniform throughout, over 25,000 gallons of water a minute would have been necessary to have absorbed the heat. It is apparent that an average large water supply of 2,000 to 3,000 gallons per minute can only be expected to control a fire in a large conical pile if applied in the very early stages of the fire.

The amount of water contained in the wood is important in slowing down the rate of combustion at the start and making it possible to get hose streams on the fire before it has attained too great a velocity. This may be the reason, that while there have been more fires in the early part of the season they have generally been more successfully extinguished than the fires which have occurred in August when the wood on the surface of the piles is more thoroughly dried, causing the fire in the early stages to spread more rapidly. The August losses have been about five times as much as the combined losses of all other months.

The amount of water required in the later stages of a fire, according to the above calculations, seems to be beyond the range of practicability. Where the same method of computation is applied to large paper mill or cotton mill buildings, it will be found that the hose streams available are about equally insufficient, although, in this case, the fuel is spread over a much greater area, but the results have generally been disastrous when the fire has passed the first lines of defense and got well under way.

A similar method of computation was used as a basis of determining the spacing of sprinkler heads

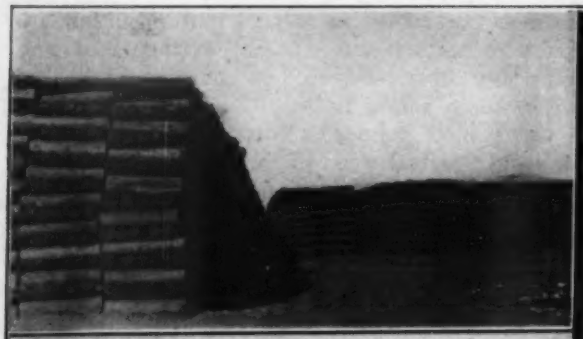


FIG.9 LOG PILES 13 FEET HIGH AVERAGE MOISTURE ABOUT 35%.

FIG.10 SINGLE LOG PILE 6 FEET HIGH. AVERAGE MOISTURE 20%.

FIG.11 SPRUCE IN RANKED PILES. NOTE DARK LINES OF ROT AT TOPS OF PILES CAUSED BY SEASON CRACKS.

FIG.12 LENZITES SEPIARIA ON SPRUCE LOGS KEPT AT FAVORABLE MOISTURE BY NEARNESS TO THE EARTH.

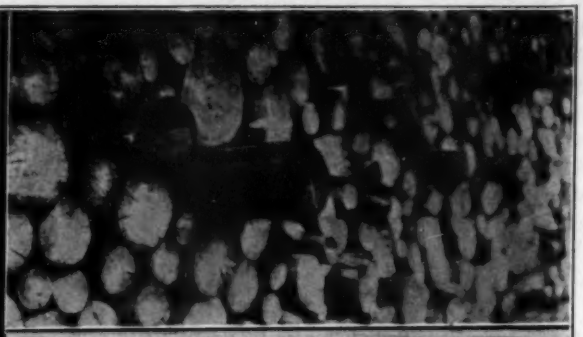


FIG.13 LENZITES SEPIARIA GROWING ON PROJECTING LOG WHICH ABSORBS SUFFICIENT MOISTURE FROM WATER FROM TOP OF PILE.

FIG.14 SECTION OF 4 INCH ROOF PLANK SHOWING ROTTING IN THE MIDDLE.

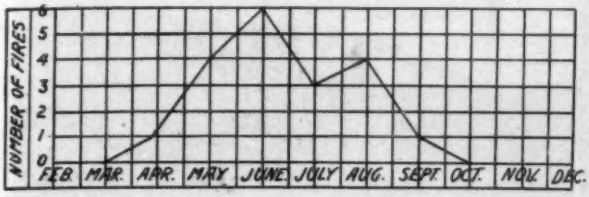
FIG.15 FOMES ROSEUS ON SPRUCE LOG AT BOTTOM OF PILE.

FIG.16 POLYPORUS PARGAMANUS ON BOTTOM LOGS OF FIVE YEAR OLD PILE.

necessary to control fires in celluloid, a substance which burns 10 or 15 times as fast as wood and therefore must have water applied 10 or 15 times as fast in order to control it. The calculated number of heads were installed in a small vault in which large quantities of celluloid were burned experimentally, and the results showed that the method of calculation was remarkably reliable.

Open Sprinklers in Continuous Operation Are More Efficient Than Automatic Sprinklers

The common cause of failure of automatic sprinklers is some unforeseen obstruction such as a shut valve, an obstruction in the pipe, or a defect in the controlling link; therefore, if it were practicable to



Fire Record

use open sprinklers operating continuously instead of automatic sprinklers, the greater part if not all of the failures would be eliminated, as with the sprinklers in continuous operation any defect would be immediately discovered; moreover, it would not be necessary to extinguish fires, as the combustible material would be kept too wet for a fire to start, and the sprinkler instead of being an extinguisher would become a device for prevention.

This form of protection while impracticable for factories is entirely practicable for many of the larger log piles. A perforated pipe of moderate size or a series of large sprinkler heads can be extended along the conveyor over the top of the pile and supplied by a pump of reasonable capacity kept in operation throughout the summer months, the object being to maintain moisture on the surface of the pile at about the same amount that is maintained by nature throughout the remainder of the year. This seems to be entirely successful in preventing fires as shown by the following fire records. Open sprinklers in continuous operation throughout the summer months should afford protection equal or superior to that of the automatic sprinkler now in satisfactory service inside the mills.

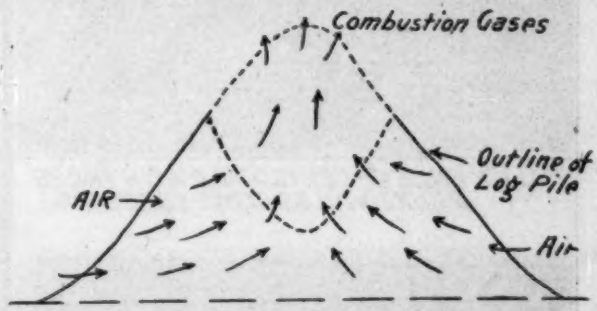
Punk Wood Important Cause of Fire in Pulp Wood

The reason that a small amount of water can give successful results in fire prevention in log piles is doubtless the part played in ignition by partly rotted or what is commonly called "punk" wood. This material which is highly combustible when thoroughly dry takes up water readily from rain or dew, but when the weather is very dry, it loses this moisture and can not only be easily ignited by the smallest spark but the combustion once started persists with the utmost tenacity, a fact familiar in fence posts which have become ignited by grass fires. Most of this rotted wood is doubtless present in the logs when they are put in the pile, as rotten hearted logs brought from the forest. Some of this punk wood is grated into small fragments by the conveyor and distributed through the pile.

Fungus plants causing rot can grow in partly dry wood in the pile causing it to rot in time. Wood kept thoroughly wet will resist this fungus growth, and wood kept dry is also immune to rot. That which is kept in an intermediate condition rots rapidly, therefore continuous sprinkling will serve a further useful purpose in retarding fungus growth in a pile which is most active in summer, as the low temperature of winter prevents it.

The Process of Combustion and Updraft in Conical Log Piles

In several of the fire reports, mention is made of the fact that the fire started at the top of the pile and apparently burned directly down to the bottom through the middle of the pile, rather than over the outside as would be expected. In the report of the fire of May 19, 1908, a drawing is given showing a conical opening in the middle of the pile which, it is stated, later fell in. A similar phenomena was observed at the fire of June 4, 1918. The following drawing shows this condition diagramatically. The unbarked logs give abundant air spaces for the draft and serve as a grate with the result, that the fire



burns from the center of the pile towards the surface rather than from the surface towards the center. Apparently, bark on the logs has a somewhat retarding influence on fires in the early stages as it tends to shut off the draft by filling these spaces. After the fire is well under way, this is probably of less importance as the updraft caused by the heat will be sufficient to cause a strong suction at the base of the fire. At the fire of June 4, 1918, the logs had the bark on; the exceptionally strong wind was doubtless the important factor in the failure of the hose streams in the early stages of the fire. It will be noted from the

FIG.17 POLYPORUS PARGAMENUS ON BIRCH LOG.

FIG.18 FOMES HIRSUTUS ON POPLAR LOG.

FIG.19 ENDS OF CENTER PILE WITH THREE RANKED PILES CLOSE TOGETHER.

FIG.20 SAP STAIN FUNGUS IN THE CELLS OF JACK PINE HIGHLY MAGNIFIED.

FIG.21 SAPSTAIN FUNGUS IN THE CELLS OF POPLAR HIGHLY MAGNIFIED.

FIG.22 HIGH LOG CONVEYOR PROVIDED WITH HOSE CONNECTIONS AT FREQUENT INTERVALS.

FIG.23 STATIONARY STACKER MAKING ROUND CONICAL PILE. COULD BE USED FOR SPRINKLING AND MONITOR NOZZLE. VERTICAL RETAINING PILES AS SHOWN OBJECTIONABLE IN COLD COUNTRIES.

FIG.24 MOVABLE STACKER MAKING OBLONG PILE. COULD BE FITTED WITH MONITOR NOZZLE BUT SPRINKLING COULD BEST BE DONE FROM TOP OF PILE.

velocity table that this was the slowest large fire recorded, doubtless due chiefly to the shutting off of the draft by the bark.

A further cause of the failure of hose stream under these conditions is that it is difficult or impossible to get water to the seat of the fire, owing to the fact that there is an enormous updraft in this crater, and, on the outside of the piles, the logs prevent the water from being thrown onto the fire from the back. This updraft has been stated in several conflagrations to be sufficient to carry burning 2-inch planks to considerable heights in the air. With such a powerful updraft, it would not be expected that a small or large hose stream, unless applied downward with force, would be able to get anywhere near the seat of combustion, but instead such part of it as is not evaporated would be carried by the updraft directly away from the fire. In most of the cases where heavy hose streams have proved effective in extinguishing the log pile fires, they have only been brought into service towards the latter part of the combustion, when the walls of the crater had burned down to considerable extent (see figure 7) and the combustion had been distributed over a wide area, considerably reducing the updraft. A very large solid stream of water forced directly down into this crater will be about the only means of successfully combatting such fires. How large the stream must be, or how to get it to such a height as to force it directly into the crater is a problem of considerable difficulty, especially with conical log piles 100 feet or more high. A good supply of water quickly available on the conveyor or other structure over the center of the pile seems to be the only way that this could be brought into service before the fire attained uncontrollable dimensions.

Bearing of Moisture on the Manufacture of Pulp

The effect of the amount of water contained by the wood on the process of pulp manufacture has been discussed with several of the most progressive and best posted pulp makers. All agree that for ground wood pulp the most thorough wetting is an advantage; all agree that uniformity in the moisture of the chips for chemical pulps is highly desirable. It is stated that a sulphite liquor can be made of suitable strength for any practicable amount of moisture that the chips can carry, but the same liquor will not give equally satisfactory results on a mixture of wet and dry chips. In the large log piles in dry weather in the summer time, the top of the pile exposed to the hot sun and wind is nearly bone dry, while the interior of the pile protected from these drying influences will doubtless contain nearly 50% of moisture. By the method of conveying the logs from pile to the mill, the dry logs from the top of the pile are indiscriminately mixed with the wet ones from the interior, with the result that, in dry weather, the widest possible variations in moisture occur. If the top of the pile was continuously sprinkled in such dry weather, the result would be that the moisture throughout would be kept much more nearly uniform. It would not be possible to get much more than 50% of water into the logs at the bottom of the pile, and those at the top might be kept up to 40% which would improve their uniformity without greatly affecting the absolute moisture in the chips. Moreover, in the large news mills where the largest wood piles are maintained, at least half of these piles are used for ground wood. Some of the mills now test the chips daily for moisture in order to determine the most desirable strength of liquor.

Wood from the large piles now averages from 45% to 55% moisture. Wood from moderately low flat piles with only a small amount of spaces between the piles contains from 30% to 40%, and this figure can doubtless be reduced to from 20% to 30% by making the piles lower and more widely separated. Dry wood obtained by this method of piling is preferred by makers of soda and better grades of sulphite pulp. Experience at the fire of June 13, 1900, indicates that the fire hazard of low flat wood piles well separated can be satisfactorily taken care of by a reasonable amount of hose streams and hydrants well distributed through the wood yard. Moreover, this thorough separation not only makes hose stream protection efficient, but is necessary to obtain the lower moisture content that prevents the growth of fungus in the piles, which is not only a saving of wood, but an improvement in the quality of the pulp produced.

At some of the mills where the best pulp is made, the rotten wood is now carefully separated from that used for pulp and sold for firewood or other purposes. If these mills will go a step further in this respect and separate out the rotted logs as they are received from the river or cars, they will not only remove a source of infection of the piles, but this punk wood which is the chief hazard of the log piles will be eliminated, and a more uniform pulp and better yield secured.

Piling of Pulpwood for Either Storage or Drying

Pulpwood piles can be divided into two classes. The first is wood which is kept to insure a constant supply for the mill and to counteract irregularity in shipments, storage over winter, etc. The keeping of this wood is a storage proposition, and it is probable that if it can be kept from rotting, it will frequently be found economical to store part of it for a considerable length of time, using the wood coming in from day to day at the wood room, and only taking from the storage when shipments are not sufficient for daily use. In this case, it will be necessary to carefully study the moisture in the stored wood in order

to know when it is too wet or too dry for the growth of wood destroying fungi.

At some of the mills, particularly soda mills and a few of the sulphite mills making a high grade bleached pulp, dry wood is stated to be highly desirable. In very few of the mills is there any determined attempt to secure this dry wood by piling or chip drying. It is possible that as the price of wood continues to advance, and the demand for better qualities of pulp increases, dry wood will be sufficiently desirable to make it worth while to adopt piling methods which will secure it. In this case it will be necessary to pile the wood in small separate piles for a certain length of time, the piles being so exposed to the drying winds as to remove the moisture in the shortest possible time. Apparently, it is possible in a few months under favorable conditions to reduce the moisture to 20% in well exposed barked piles.

If wood is left in ranked piles for two years or more, the season cracks opening on the top logs absorb moisture and cause abundant growth of fungi on the top of the pile. These piles generally are found rotted at the top and bottom and sound in the middle, except where some of the logs have projected and thereby taken up an abnormal amount of water. See figure 13.

Water a Cheap and Efficient Means of Preventing Rot

Sound wood from prehistoric times has been found in the lakes of Switzerland. Water logged logs from the bottoms of rivers and swamps are sawed into lumber after being submerged for many years. Dry lumber in the roofs of churches and in furniture is sound after hundreds of years. Fungus causing rot grows in partly dry wood. Fence posts rot first at the surface of the ground remaining sound much longer under wet ground and in the dry air above the ground. Observations in the rotting of weaving mill and paper mill roofs indicate that rotting takes place most rapidly in wood which is at equilibrium with water saturated air. Such wood contains about 30% moisture. Figure 14 shows a section of planks from a paper mill roof rotting through the middle. The top of the plank was too wet to rot, and the bottom too dry to rot.

Exact knowledge is not available as to the upper and lower moisture limits of the common wood destroying fungi. There is doubtless slight difference in the moisture and temperature requirements of the different varieties of fungus as indicated by the position at which they are found in log piles and on roofs. No fungus can actively grow at freezing temperature. This fact is doubtless useful in keeping logs in the large piles in cold climates where the heat insulating action of the wood keeps the interior of the pile not far from freezing most of the year.

The fact that wood which has been in the water for some time appears to acquire an increased power of resistance to fungus might be made use of, where it is necessary to float logs for some distance, in reducing the loss from rotting,* the wood which has been a long time in the water being selected out and kept for the storage pile, and that which is received by cars being put into the wood room at once.

When wood is to be kept for some time in ranked piles such as those shown in figures 9, 10 and 11. It would doubtless be worth while to split the top logs in halves, placing two layers with the heart or flat sides up and giving the piles sufficient pitch so that these flat logs will serve as shingles shedding rain water from the top of the pile. There would be little tendency to form season cracks on the heart side of the split log thereby reducing the absorption of water and the resulting rotting.

Fungi That Affect Pulpwood

Only a few varieties of fungus are concerned in the destruction of pulpwood. This is due partly to the fact that only a few varieties of wood are used for pulp. The moisture and temperature at which the wood is kept doubtless also is a factor.

Lenzites Sepiaria is the most destructive of spruce, hemlock and pine. It grows at the top of the pile where either season cracks or bark causes the wood to take up sufficient moisture to meet its requirements. Frequently, fruiting plants will be found growing at season cracks on the top of a log while the bottom of the same log is too dry to support this growth. See figure 13. When located near the earth the entire log contains sufficient moisture to support this plant. See figure 12.

Fomes Roseus has a rose pink fruiting plant and is frequently found on spruce, hemlock and pine. It apparently requires a lower temperature and more moisture than the lenzites as it is generally found near the earth or in the interior of log piles. Figure 19 shows it on the ends of a ranked pile of spruce which had another pile close against it. This plant did not extend to the top of the pile, but where there are three or more ranked piles close together as shown in figures 9 and 11. It is almost always to be found on the ends of the center pile if it remains undisturbed for two years or more. Figure 15 shows an abundant growth of this plant on a spruce log which has been in contact with the earth and surrounded with weeds for several years.

Fomes Hirsutus is the most common destroyer of poplar and some other varieties of soda pulp wood. It is apparently able to get along with a moderate water supply at the top of the piles. See figure 18.

Polyporous Paragamenus, a smaller bracket fungus, violet towards the edge of the under side of the fruiting plant is frequently found on birch and less frequently on other kinds of pulp wood. It is much

*Timber rot caused by Lenzites Sepiaria by Perley Spaulding, U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 114, Page 28.

less common that those previously mentioned. See figures 16 and 17.

Many other varieties of fungus are sometimes found on pulp wood, but they are not frequent enough to be important factors in the destruction. A careful study of the habits and requirements of the above mentioned varieties should give valuable suggestions as to the most practicable means of combating them. Observations thus far indicate that controlling the moisture is the most practical method of attack.

Ceratostamella Pilifera is a very common sap stain fungus which gives a slate blue color to the sap wood of the pines and many of the pulp woods. It is generally characteristic of sap wood, but does not cause rapid weakening of the fibre like wood rotting fungi. The filaments in the wood cells are large and dark colored and may cause specks in the pulp. See figures 20 and 21. Mr. McCubbin* mentions a case in which sap stained wood gave discolored pulp. He states that the wood showed discoloration, suggesting rot which is not commonly caused by the sap stain fungus; but sap wood is rapidly attacked by all sorts of fungi to which the variety of wood is subject, and generally several varieties of fungi may be found in the same sap wood.

I am inclined to believe that a cause of the specks in the pulp may be water logged sap wood. The sap wood takes up water much more rapidly than the heart wood; therefore, pulp wood which had been acted upon by water for a short time would have the sap wood saturated and the heart wood comparatively dry, with the result that the sap wood chips would locally dilute the digesting liquor and remain uncooked when the heart wood was thoroughly cooked. In this case, it would be expected that this uncooked sap wood would be to some extent taken out by the screens, and these screenings would show the characteristic sap stain fungus, as Mr. McCubbin states was noted in the case which he investigated. On the other hand, if pulp wood is subject to drying influences, the sap wood would be expected to give up its water more quickly than the heart wood and would therefore be cooked more rapidly. Any method of handling pulp wood which will keep the heart and sap wood at the same moisture content should correct this trouble.

Special Winter Hazards of Log Piles in Cold Countries

A notable exception to the general rule of log pile fires in summer was a fire in a log pile in a cold climate and which was not insured. This occurred in February and consumed 4,000 cords of wood in three days which gave a velocity of combustion of 2,500 pounds per minute. Fourteen hose streams throwing about 3,500 gallons of water per minute were unable to extinguish the fire, probably due to the snow and ice which served as a roof and threw off the water.

At the point at which the pile was ignited, it was retained by a vertical pile, as shown in figures 23 and 24, which due to its perpendicular surface was not covered with snow; therefore, it exposed a large surface of wood to the drying action of the wind. The fire was probably started from live coals from a stove in a watchman's house at a surge tank above this pile. The snow and ice prevented the penetration of the water from hose streams into the pile, and doubtless due to the screening action which kept out the air, the most of the wood was transformed into charcoal. This experience suggests that it would be advisable to avoid high vertical retaining piles in cold countries.

Doubtless, such vertical piles in cold countries are dryer in winter than in summer, as there is practically no rain due to the low temperature. The snow which covers the top of the pile forms a roof over it and rather increases the dryness than otherwise.

If such piles can be given sufficient slant to hold snow and ice, this will not only protect the wood from sparks but will shut off the draft by filling the spaces between the logs. The slow velocity of this fire was doubtless due to the scant air supply caused by the partial covering of snow.

Most of the larger sulphite mills at the present time are using wood containing 40% or more of moisture, and but few of the mills have wood which contains less than 30% of moisture. From 30% to 40% of moisture appears to be the most favorable range for the growth of fungus.

Pulpwood Stackers and Conveyors Can Serve as an Important Part of the Fire Protection

The stacking and conveying apparatus in use at the pulp mills can doubtless be made useful at slight cost in connection with fire protection. In many cases where very large piles of logs are kept, the elaborate conveying systems in use will factilitate both the continued wetting of the piles in dry weather as well as quickly getting at a fire on the top of such a pile; whereas rough and tumble stacked piles are difficult and dangerous to climb with hose streams, and such a process must necessarily be slow.

It is generally appreciated among the mills that in the next few years careful study must be put into the handling and storage of wood. The high price of wood as well as the high price of labor make it necessary to avoid loss by rotting, and the elimination of hand labor, possibly by use of more complete conveyor systems.

If the piles are sprinkled, this process will only be required during dry weather or when high drying winds prevail in the summer time. At such time, an abundant supply of water should be used. In the majority of mills, pumps and pipes are already being

*Pulp and Paper Magazine, May 15, 1919, Page 461.

installed or are under consideration for fire protection, which will also serve for sprinkling.

In nearly every case, centrifugal fire pumps from 1,000 to 1,500 gallons capacity are advisable. These will be found more economical than steam pumps, and can be throttled down so as to deliver only the required amount of water. It will probably be found more economical generally to use them in this manner than to install smaller pumps for the length of time the sprinkling will be required.

A number of experiments have been undertaken by several mills, particularly from the standpoint of wood preservation by means of water. While this is familiar enough to everybody, it has not been used practically as a means of protecting pulp wood and ground wood pulp from rotting; therefore, exact figures as to the limiting amounts are not at this time available.

Handling and Costing Raw Materials in the Manufacture of Paper

F. C. CLARK, M. M. KILEY AND H. R. HARRIGAN
American Writing Paper Company

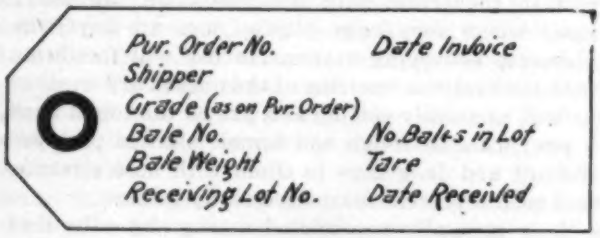
Presented at the Joint Meeting of the Local Branches of the Cost Association and the Technical Association of the Pulp and Paper Industry on Monday Evening, January 19, 1920, at Holyoke, Mass.

The following is by Mr. F. C. Clark and is a treatise on the subject of handling rags in the manufacture of paper. The handling of old papers and pulp will be treated in succeeding numbers and should prove interesting to our readers.—Editor.

WHAT we are going to try to do is to run through, very briefly, with graphical charts, and show how rags are handled and how they must be handled if we are going to get costs accurately.

First, we have a bale of rags come in from the car. They must be run over scales in order that they can be checked up with the invoice weight, and a tag similar to the following sketch, is attached to each bale.

The next operation is to bring the bales into the



Bale Tag

room where they are opened. A bale of rags is in three parts: the bale wire; packing and wrapper, such as old carpets; and the rags.

The rags then go to the thresher. Rag-room charges are first applied here. After the rags have passed through the thresher, they are run through the dusters and good rags are obtained. These good rags are run over a scale and weighed out in 100-pound lots and given to the sorters. The dust obtained then goes over a scale and is weighed. After passing the sorters, we have sorted rags, muss, dust, and out-throws. The sorted rags again go to the dusters, and the dust, muss, and out-throws are then weighed.

Enough scales are put in all the way through. The packing and wrapper are weighed, the rags are weighed going to the sorters, and the muss, dust, and out-throws are weighed, and these weights added together check up with the invoice weight. The weight of the muss, dust, and out-throws, plus the weight of the sorted rags, checks up with the weight of the rags going to the sorters. The rags, after leaving the duster the second time are not now weighed. It is most essential that the man loading the rotary boiler shall have a quick and easily obtainable figure showing the weight of rags loaded, and from this figure it will be possible to add a definite amount of alkali, based upon the rags actually loaded into his boiler. If a scale is not used to weigh the rags put into the rotary boiler, it will not be possible to secure a quick as well as accurate figure showing just how much alkali should be added, based upon the rags loaded into the boiler. It would, of course, be possible to take the last previous scale weight shown on the chart and to subtract the waste materials thrown out, which is also indicated on the chart, and thus secure a figure that is a close approximation of the amount of rags loaded into the rotary. This calculation would be difficult to obtain by the class of help now found in the rotary boiler room. For this reason, all calculations should be eliminated. This may be accomplished by having the necessary tables suitably printed and framed, for use by the rotary boiler-room workers.

By having the scale flush with the floor and hopper-bottom cars, which would take the rags from the conveyor at the end of the duster, it would be possible

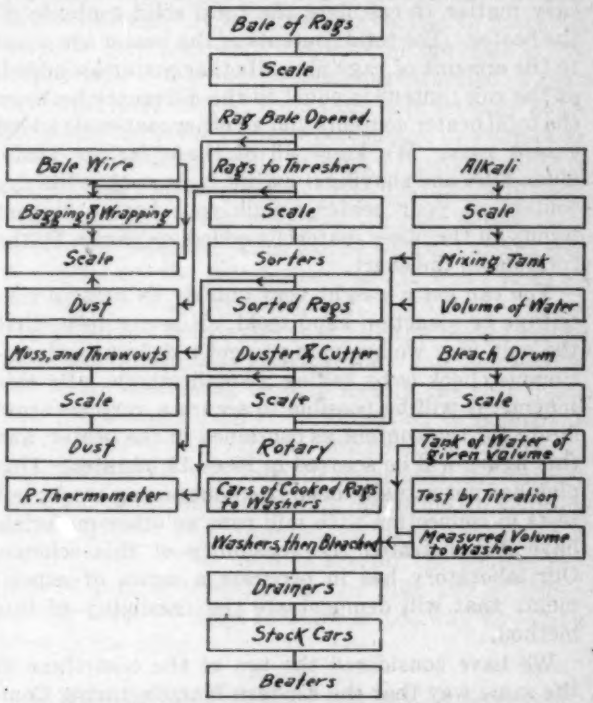
to drop them directly into the mouth of the rotary boiler, and so eliminate the possibility of getting any wood slivers from the floor into the stock.

There should be a definite amount of water going into the rotary, depending on the number of hundred pounds of rags. That means that it is a very simple matter to figure out the necessary table. For example, a 10,000-pound rotary boiler should have a definite amount of water; an 8,000- or 9,000-pound batch of rags would therefore have a volume of water equivalent to the amount used when 10,000 pounds of rags were loaded into the rotary.

In addition, we put a certain amount of alkali into the rotary. If it is soda ash, it is received in bags; in the case of lime, it would probably be received in barrels. A definite amount of alkali is added to the mixing tank, into which has already been placed a given volume of water that is required for the cooking process. When these materials are received, they must of course be weighed in order to check the invoice weight. This is shown by the scale on the chart. This scale may be the same scale that is used in weighing the bleach, as well as the same scale that is used in weighing the rags as received. The scale is shown in this particular point of the chart to point out again the necessity of weighing all material received in order to correctly check the invoice weights.

Recording Thermometer

Pressure gauges of indicating type are now generally used. For example, it is a common practice in mills at the present time to turn on the steam at the rotary boiler, either with or without a reducing valve. After the steam has been on for two or three hours, it is customary in many mills to close off the steam and allow the boiler to continue to rotate for six or eight hours additional, but without any steam turned on. The surface of the rotary boiler is so large that I believe it is more and more likely that the temperature drops continuously throughout this six- or eight-hour rotating period, although the pressure may not drop materially. Cooking is done by temperature and not by pressure; therefore, a pressure gauge which shows the pressure remaining somewhat nearly constant, regardless of whether it is 10 pounds or 40 pounds, does not give us any figure by which the cooking process may be controlled. If, however, a recording temperature gauge is used in place of a pressure gauge, we will then have a record of the temperature throughout the cooking process. Evidence which we already have in the laboratory is beginning to show some very interesting facts in regard to the correct cooking temperature for rag stock. We know that most rags are over-cooked, resulting in losses in the rotary boiler, and additional losses in bleaching, due to the fact that over-cooked rags require more bleach in order to bring up the color to the proper degree of whiteness. Over-bleached rags also mean loss in strength and a much greater tendency to turn yellow with age. Accurate knowledge of what are the best cooking temperatures, together with a method by which these correct temperatures may be obtained at all times, can not fail to produce better results, having a greater uniformity. In cooking sulphite pulp, it is necessary to have a pressure gauge along with the recording temperature gauge. The pressure is essential in this case in order that you may be able to force the cooking liquor into the wood chips, so that cooking of the wood chips may be carried in through the body of the chip uniformly. This, however, does not hold true in cooking rag stock, because of the much greater rate of



absorption of the cooking liquor of rag stock as compared with wood chips. This matter of a recording temperature gauge on a rotary boiler is essential and special emphasis is therefore given to it.

After washing, the rags are dropped into the drainers and, as required, are dug out into the stock cars, and put back into the beaters in the usual way. No definite recommendation can be made at this time that will change the present method of taking rags from the drainers. A plan is suggested, however, that will enable the mill or beater engineer to secure a constant check on each beater that is dropped. For instance, you are asked to furnish a paper having a rag content of 50 per cent. That may be three cars. Up to the present time you have relied entirely on the man who is taking the rags out of the drainer to put in the correct amount of rags. In order to check up more closely what is actually going into the beater, this method is suggested. Just before dumping the beater, it is filled to a definite height. A sample is

then taken from the beater, which is representative of the contents of the beater, and put into a can with a small top and a much larger bottom. The small top has the advantage in that you get a "struck" measure. We know how much pulp has been added, as will be shown a little later on by Mr. Harrigan. We know the amount of old papers, and the amount of rosin, alum, filler and shavings added with a fair degree of accuracy. The only thing we don't know and are not able to check is the amount of rags put in. If we know that the beater holds a certain definite volume when filled to the mark referred to above, and that the one-gallon or one-quart sample taken has a definite amount of solid matter, it is then a very easy matter to calculate the total solid contents of the beater. The total contents of the beater are equal to the amount of rags plus all other materials added, or the rag content is equal to the difference between the total beater contents and all other materials added except rags. We know all of these factors (pulp, alum, filler and shavings) except rags, so that the rag content of your beater equals your beater content minus all the other materials added, as shown by the formula on the chart.

You can get a weight very quickly by using a centrifuge or a suction hand mold. It seems to be that the only way we are going to get a definite and continuous check is by taking a small sample. By this scheme, it will be possible to secure a very accurate figure for rag content as contained in the beater, and this figure will be secured in 10 or 15 minutes. This plan has not actually been tried out on rag stock; but tests in connection with mill runs on other materials have demonstrated the feasibility of this scheme. Our laboratory has in progress a series of experiments that will demonstrate the feasibility of this method.

We have considered the use of the centrifuge in the same way that the Eastern Manufacturing Company has used it, but do not recommend it because of certain difficulties. It is also understood that the Eastern Manufacturing Company has discontinued the use of this centrifuge method. We have in mind some work using wet machines, as we believe that it will be possible to develop or devise some equipment that will enable us to take our stock from the washers, run it over a wet machine, and then press it hydraulically, after which it is added to the beater by the inch measurement in much the same way as sulphite pulp is now handled so successfully in some mills in Holyoke.

Questions

Mr. Hutchinson: Where we use two grades of furnish in the same beater, how is the method you propose going to help out very much in determining what the actual dry weight of each grade of furnish is in the beater?

Mr. Clark: I don't see how at the present time we can do that. A wet machine will eventually be used to get the stock from the washers into lap form. The proposed method is believed to be better than the present methods in that it gives a quick as well as accurate check. We believe, however, that ultimately it will be possible to develop a method by which rag half-stuff may be put into hydraulically pressed laps, and then measured into the beater by inches similar to sulphite pulp.

Mr. Bush: How much filler does Mr. Clark figure he will lose when he puts his test sample into his centrifuge machine? We have always figured that there was a certain amount of filler which is lost. We figured that we retained only a certain percentage after it is put into the beater, sometimes more than others.

Mr. Clark: In cases where there is a large amount of filler, it will be possible to use a suction mold having a fine wire mesh, or even silk bolting cloth. This method would prevent any appreciable loss of filler or fibre.

Mr. Tucker: You speak of taking the sample just as you empty your beater in order to get uniform rag content. It seems to me that this will not aid you materially in controlling the rag content, because you can not add rags if there are not enough, or take any out if there are too many. I don't see how your proposition is going to help out the man in the mill who must bring his paper to 50 per cent rag. One beater may contain 45 per cent rag, the next three cars of rags he puts in may give him 60 per cent in the next beater. He won't know his rag content until the beater is ready to go down, because he can not get a sample until that time.

Mr. Clark: That's perfectly true. There is no chance of adding more rags or taking any out, but it would be decidedly well worth knowing that the rag content was 60 per cent and to get our costs on that basis than to have the cost just that much out of line. It is possible to add more rags in the second beater when making paper for the Government, where you have to live up to definite specifications. This method will enable the beater engineer to have a closer check upon the man who is taking the rags out of the drainer. At the present time he has no check at all. A check from each beater is a very much better proposition than to wait a day or two to get a report from the laboratory.

Mr. Barrett: Mr. Clark seems to have made more provisions for weighing than are used at present. It seems to me that the scale just prior to putting the rags into the rotary is unnecessary and would hold up the operation.

Mr. Clark: I don't believe it would hold up the operation more than a few minutes. The scale would be flush with the floor. The cars could be run over the scale and weighed, pushed to the manhole over the rotary, and the valve pulled.

Mr. Mathieson: I don't think it is practical. It

takes all of a man's time to get his rotaries filled up. I don't think he could possibly work it that way.

Mr. Clark: Suppose you have a 10,000-pound rotary; how do you know you are putting in 8,000, 9,000, or 10,000 pounds of rags? How are you going to know how much alkali to put in if you do not know the amount of rags going to the boiler? Is it not worth while to make a definite proposition and not to guess at it?

Mr. Yoerg: It strikes me as a little bit unnecessary. From the duster, the rags go by a chute to the rotary. I can hardly see the necessity of weighing the rags before going to the boiler.

Mr. Hutchinson: Would it be possible to use an automatic scale when weighing the rags?

Mr. Clark: Yes. A number of concerns now manufacture such scales. They consist of a hopper so arranged that it will fill to a certain weight. When the required amount of materials has been added, the supply is temporarily stopped during the time of dumping the contents of the hopper. All large modern boiler plants using overhead bunkers for storing coal use a system by which the coal is weighed automatically in this type of scale.

Mr. Hutchinson: At our company we have less trouble in getting accurate reports of rag consumption than sulphite consumption. The discrepancies in reported consumption and actual consumption show that we get more accurate reports on the consumption of rag stock than we do on the consumption of sulphite.

J. Johnson: I would like to ask if anybody has made any tests on the amount of dust obtained from different grades of rags. I assume that there's apt to be a considerable variation in some grades of rags. I would like to know whether that's so or not.

Mr. Hutchinson: If no such variation exists, I assume that the present practice of weighing the rags immediately after they are sorted would be sufficient without the necessity for another weighing as they come from the duster.

Mr. Nixon: Some experiments were run at the Chemical Paper Company on whether or not there is a difference in the amount of dust obtained from different grades of rags. The results of these tests showed that thirds and blues had a shrinkage to the boiler of practically the same percentage. That being the case, I believe the results obtained would be more accurate than they would be by using a scale. The shrinkage on thirds and blues might not be the same on another grade of rags, but you could determine the per cent of shrinkage on all the different grades of rags.

Mr. Brewer: Mr. Clark has now under way some experiments in the laboratory on the shrinkage of thirds and blues.

Mr. Hutchinson: When these experiments have been completed, do you intend to keep the information obtained in the company, or will it be given to the industry?

Mr. Clark: This information will be contributed to the industry.

Mr. O'Connor: I would like to ask Mr. Clark what he thinks of the possibility of using a combination of the microscopical analysis together with the centrifuge process for determining the rag content of the beaters.

Mr. Clark: You would have to get a microscope for every mill and someone who is trained to use it. You can not take any of the usual help that is around a mill and depend on it to do that kind of work with a high degree of accuracy. You must also have a stain that is correct. It is almost impossible to make an accurate fibre analysis if the color of the stain is off.

Mr. Balch: Our rag foreman has informed us that the percentage of dust from rags is practically standard, and we use a uniform percentage in connection with that for each grade of rags. I understood Mr. Clark to say he was going to weigh his muss and dust. I don't see any use in weighing the rags before they go into the rotaries. They can be weighed afterward. It won't hurt the calculations, and it won't hold up the amount to go into the boiler.

Mr. Bush: If samples taken at the beater are to give certain results, perhaps they can be used to determine something besides merely the cost question. Mr. Clark calls it "information to determine the correct cost." If the information can be so handled that it will help to determine the correct handling of the manufacturing operation, in addition to the correct cost records, we have arrived at a double result. Cost records are for the double purpose of helping operation in the mill, and of determining what we want to know in the way of selling price in the office.

Instruments Required for Burning Coal

Without the aid of recording or indicating instruments, it is not feasible to apply measures of economy. While an experienced fireman can approximate the conditions of a fire by looking into the furnace, it is impossible for the average man to do so. The following instruments should be installed and backed up by intelligent supervision and a definite plan of records.

a. Draft gauge, indicating the draft in the furnace above the fuel bed; generally a gauge indicating 1½-inch water column pressure.

b. Draft gauge, indicating the draft at boiler side of the flue damper; generally a gauge indicating 2-inch water column pressure.

c. Steam flow meter for individual boilers. The indicating type of meter is preferable due to simplicity.

Additional instruments, such as recording flow meters, recording pyrometers, etc., may be of advantage dependent upon plant organization, size of plant, and operating conditions in general.

What Is the Good?

What is the good
In being a man,
An atom in space,
A part of the plan
Of the uni-verse
If one is to waste
His measure of life
In ceaseless war
And endless strife,
Where curse meets curse?

What is the good
In having a will
If we use this gift
To any man's ill
With selfish intent?
If we are to gain
By our every act,
We forever must add
Nor ever subtract,
And evil give vent.

Where is the good
In having a trade,
Mere money to make,
Mere want to evade—
A slave of the night,
If our powers we use
Like a grave digger's spade
To injure another,
Or make him afraid,
And steal his right?

Where is the good,
With the world so wide
That each has a place,
And none need hide
His talents real,
If one tries to filch
Success from his brother,
In vengeance and lust,
His own lack to cover?
Thou shalt not steal.

—Written for The Paper Industry by R. L. S.

Fuel Economy and Power Plant Control

By F. A. MORELAND, Comb. Eng.

Presented at the Meeting of the Miami Valley Division on February 28, 1920, at Hamilton, Ohio.

FOR many years, manufacturers have talked about the "Days of Competition," but there has been so many changes brought about the last year due to the after-war conditions that now-a-days we hear little of competition—it has changed to "Production" and we usually hear the familiar question: "Can you produce?" instead of "Can you compete?"

Today, it is the man who can deliver that carries home the order for the "Bacon," and the more you can produce per dollar of expense and investment the greater will be your opportunity of getting your share of the business, for if your standard production is based on economy of operation, it will reflect the fact in the prices you are able to make, and your output will be such as to enable you to deliver.

Waste to a greater or less extent is found in every power plant, and paper mills are no exception—in fact the location and surrounding conditions of a paper mill are often such as to make it one of the worst examples of wastefulness as compared with many other industries.

There are many opportunities for waste to get in its work between the tree of the forest or the rag of the back alley, and the finished sheet of news stock or foolscap that is loaded for transportation.

I desire once more to focus attention to that great universal problem of present day manufacture, namely, "Coal Expense." The recent war knocked very forcibly on the front doors of your mills and strongly emphasized fuel economy propaganda, such as you have heard from many sources for the last ten years, and the need of fuel conservation dawned upon you in an entirely different light, because you were brought face to face with a shut down, and with increased coal prices.

When fuel conservation was first forced upon the steam producers, a man from the Pittsburgh district hit the nail on the head when he said to force people to save coal, it was only necessary to put the price high enough, and it would impress itself on the pocket book of the coal buyer and produce fuel conservation. The coal operators have evidently profited by this suggestion, as you are aware from the amount of your coal bill, today compared with five years ago.

The great period of transition that brought power plant managers and operators to their feet with a jerk was that of the recent war, during which we were confronted with a fuel shortage that made the practice of fuel economy imperative. Hundreds of our most competent consulting and operating engineers were called together and out of the streamlets of ideas sprung a great wave of economy that practically forced the steam producers into a saving of millions of dollars.

I venture to say that there is no department in your particular business where the raw material is handled with less check on the results than in the boiler room. It is of course true that in the use of other raw materials, the product can be easily seen and the results determined, but with coal the products of combustion are usually invisible, and the steam that the coal produces is confined where it is almost impossible to determine the amount except by some system of steam flow measurement.

Go back with me for a few moments to the office and note that as the cashier receives the money with which to finance the day's business, he makes a record of it, and of all the receipts and disbursements during the day, and at night he is required to account for every cent. Now, transfer your vision to the boiler room. You hand over to the fireman a big pile of money just the same as to the cashier, but instead of asking him to account for every cent you leave it in his hands carte blanche to shovel into the furnace. And it gets into circulation so quick that it is here now, and gone the next minute, and if you don't hitch the heat units up to the water, there will be just so much more added to the atmospheric temperature.

In every ton of coal, the actual amount that does useful work is extremely small, and, out of every five tons of coal that is delivered to the plant, about 200 pounds, or 1%, is actually used in the final product. Remember that over 50% of the energy in the coal escapes with the exhaust, so that if you can find use for your exhaust steam, do so by all means. It can be used for heating the feed water and for heating, as well as for other things about the plant.

One of the great problems is that of labor. You all know the trouble in getting competent help in the boiler room. Heretofore, neither compensation nor environment was much of an attraction for intelligent men in the boiler room. Compensation has of course increased, but no more so than in other positions higher up, so that it is really a fact that you still labor under the same conditions of a low priced man to handle a high priced raw material. You would save money by putting in a competent man to do nothing else but look after the efficiency of the power plant. In most plants, the engineer is required to do everything including plumbing, gas fitting, electric wiring,

and steam fitting. Go into the boiler room of many of our plants even today and look for the engineer, and you will probably find him with a wrench in one hand and a hammer in the other, trying to fix things all over the mill. He hasn't time to supervise the boiler room.

During the last few years, the boiler capacity of the country has increased at least 25% and this has added to the amount of fuel required for boiler opera-

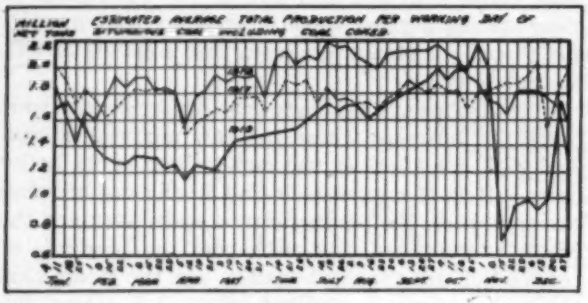


Figure 1

tion. Even today, boiler manufacturers are all oversold, and it is almost impossible to buy a new boiler with an early date of delivery. You do not have to go back very many years to find a time when manufacturers of this country paid little attention to economy in the boiler room. All materials seemed to be inexhaustible, and we floundered around in waste of every description and never thought for a moment that the time might arrive when our material resources would reach the present day conditions. We are waking up gradually and are nearly as strong for conservation as we were formerly in disregard of it.

Go back to the year 1850 and you will find that the coal production per capita was only 304 pounds. In a little over 50 years, or in 1910 it reached 10,068 pounds. This rate has increased still more in the last ten years, so you must see the need of practicing economy.

Coal is money, and money is not only the stuff that profits are made of, but money itself is made from the very product of your industry. Fuel is one of the largest single items of operating expense in your business, and you know it because the coal bill continually reminds you of it. It plays a wierd tune on the heartstrings of your purse.

The amount expended for coal is on the average about two-thirds of the total expense of boiler and engine room combined, and naturally the point of greatest expense is usually the place to make the biggest saving.

Fifty years ago, steam engines consuming less than 40 pounds of steam per horse power hour were exceptions. Today, anything over 20 pounds is considered unsatisfactory. Fifty years ago, the average boiler efficiency was about 60%. Today it still hangs at about the same old figure. This shows why the boiler room is the field for fuel saving labor.

Larger units in the engine room are demanding more capacity resulting in larger units in the boiler room, as well as more of them. Modern stokers, coal and ash handling machinery, together with up-to-date boiler room instruments have come into more general use, but in spite of all these, there is much room for improvement.

Note (Fig. 1) the comparison of the coal mined during the years 1917, 1918 and 1919. From the curves shown you will see that the production of coal in 1919 was considerably less than in 1918, and you will be able to note how the strike affected the coal production during the last few months of 1919. The average daily production of coal in 1918 was 1,913,000 tons, while in 1919 the average fell to 1,472,000 tons, or a falling off of 441,000 tons per day.

Fig. 2 shows the fluctuations in the price of Southern Illinois coal during the last six years. The indications are shown for 1915-1917-1919. Note the price at the close of 1915 and see how one year later it jumped to almost double. Then, during the summer of 1917, prices dropped, because of the government setting the prices. Along in the fall when the hand of the government was released, prices began to climb and they have been climbing ever since, until today coal is the highest in price that it has ever been, and prices will no doubt go higher as soon as the present miner's

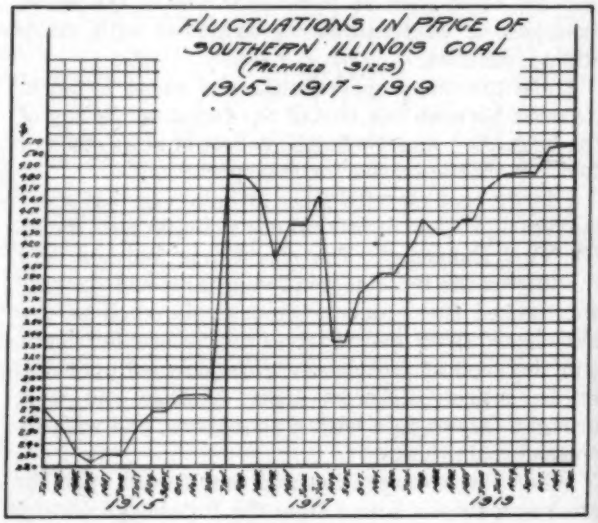


Figure 2

wage dispute is settled, for in the final analysis, the consumer must pay. It is the high prices that continually impress you with the need of fuel economy practice in your boiler room.

What does the fireman care how much the steam costs? He puts the coal in a class with all the heavy stuff to be handled in the boiler room, and when one pile is gone he knows there will be another to keep going. All he has to do is to keep the steam pressure as near as possible to the pressure required to operate the plant, and if no one disturbs him, why

should he worry. If you want to cut out waste in the boiler room, you must first study the problem yourself, and then you can talk intelligently on the subject to your men who handle the coal pile.

Quite a few of our plants are changing over to electric drive in an endeavor to get away from the fuel situation. Electricity is doing a multitude of things which go to make up our civilization. Electricity, however, is secondary to coal, because it takes coal to produce the electricity, and engineers who appreciate this know that coal stands behind the boiler that generates the steam that works the engine that drives the dynamo that generates the electricity that does all these wonderful things. It is a well known fact that if one power plant can generate electricity and sell it to you at a rate that will produce a profit, you ought to be able to produce your own electricity as cheaply as the other fellow and save the profit, and, if you can't do it, your plant needs a careful investigation, for you have a big opportunity of using your exhaust steam where the electric plant does not.

In the paper mill, steam is a necessity, because much steam is required in the paper process, and it therefore makes it possible to generate your own electricity to advantage, at least in the great majority of plants.

It is frequently expressed that when coal becomes scarce or too high priced that water power will be the source of generating the power. We have it from reliable authority that water power will be totally inadequate to supply our needs in the future. A recent investigation of the water power possibilities of this country revealed the fact that if every single river, stream and waterfall were utilized to the utmost and delivered electricity at 100% efficiency, the power developed would not be sufficient to run the wheels of industry in existence today. Taking into consideration the increase in the use of power everywhere, and the immense amount of coal burned for heat generation, you can readily see that this country for generations to come must rely upon coal for its power requirements. At Niagara Falls, a recent development has taken place which causes a comparison of real interest. At this point is located the largest water power development in the United States, and it furnishes electricity at a rate which has headed many industries to that district. A steam power plant has recently been put into operation near Niagara Falls which delivers a kilowatt hour at the switch board for less than it can be produced by the water power plant.

How to Go at It

In the first place, somebody must be responsible for the correct method of furnace operation. See that the settings are tight, as while the settings may look all right, there are no doubt a lot of small cracks, which while they don't look dangerous, really amount to a big waste when added together. See that the dampers are in order and that the fires are of proper thickness for the draft employed. If the draft is too great, then the damper should be set to reduce it.

Your boilers were built with tight walls, and all doors fitted reasonably tight, so that all air would enter through the grates. It is your duty to see that the walls are kept tight, and you would be astounded to learn from actual experience the enormous loss caused by air leaks due to cracked settings and leaky doors. Take a torch or candle and inspect the settings, and you will find cracks where the suction is great enough to snuff out the candle flame. In many places, it is possible to insert the fingers around the blow holes and clean-out doors. On a return tubular boiler, look for leaks around the blow-off, and at the point where the rear combustion chamber arch butts up against the rear boiler head. Watch for big cracks in the rear wall caused by the thrust of the boiler. On a water tube boiler look out for leaky baffles, see that the blow doors are tight, and watch the headers where you will find an abundance of air leakage, particularly in a boiler of the B. & W. type, where a filling or calking is used to stop air leakage into the first pass of the boiler. Don't assume that the boilers are tight: give them a thorough inspection, and then go over them at least once a month; it pays, and you'll see the results in the coal bill.

The Wrong Way of Quieting the Boiler

Some firemen attempt to control the boiler when it reaches the popping point by closing the ashpit doors. This is wrong and decidedly wasteful, because it increases the vacuum in the furnace and the inflow of air through all the numerous cracks, crevices and holes is multipled. Uptake temperatures rise and the steam is checked, but heat energy is wasted.

Control the dampers in preference to the doors, and reduce the uptake temperatures instead of increasing them. Controlling the dampers reduces the vacuum in the furnace, causing less air inflow through the cracks, and heat is conserved instead of wasted. When the load increases, increase the draft, and when the load decreases, reduce the draft. The load governs the draft and fuel feed. Likewise a change in feed water flow or temperature and furnace conditions will have a bearing on the draft and fuel feed.

Bring fire and water together and the result is steam. The process consists of getting the heat out of the fuel and into the water. In doing this, there are just two general problems to be considered. First, produce the heat units economically, and second, see that they are transferred quickly and easily to the water within the boiler.

Before taking up the economical production of the heat units, let us get soot and scale out of the way first, because every engineer knows, or ought to know

by this time, what it means to have the boilers that are free from soot and scale.

Get Rid of Soot and Scale

Boilers should be cleaned of soot and scale accumulations frequently, so that the heating surfaces are kept in proper condition to perform their functions all of the time. Years ago, engineers paid little attention to boilers in the stationary plant, and many of them are still neglecting them, permitting the soot and scale to be removed when they feel like it. Soot on a return tubular boiler should be removed every four hours and on a water tube boiler every eight hours. Soot deposits affect both the efficiency and the capacity of the boiler by resisting the passage of heat energy from the gases to the water in the boiler. They make the chimney work harder to give the required draft and will be found among the things that roost upon the monthly coal bill. Insufficient draft trouble would entirely disappear in many cases if proper attention was given to the heating surfaces and to the air leaks. The effective draft can often be doubled by attention to these matters. This leads up to one of the most important subjects of boiler room economy.

Draft control is one of the most important factors in obtaining and maintaining combustion efficiency. No draft means no fire. With too little draft the boilers cannot meet the load, and the steam that is made will be made wastefully. With too much draft, the waste is a sure thing. How much draft do you have and how much of it is used? Does your fireman use the dampers? How much attention do they get in a day's run? I have seen some boilers that were not even equipped with dampers at all. Very few of the steam plants shift the dampers at all during the day.

Draft and the Proper Way to Control It

The grates and the draft are provided for the express purpose of burning your fuel, and the best grate is the one that will burn the most coal in the least time. Give a good grate and a good draft a free hand at your coal supply and the fuel waste will be indescribable. You can be assured of anywhere from 25% to 50% waste, because the only thing that the combination knows is to burn fuel. Naturally, you want to burn only just enough coal to efficiently handle your load, but you must bear in mind that, in every plant, an excess of draft is provided to cover increase in loads and additional increase in boiler capacity. Because your furnaces and draft are suitable for producing 2,000 horse power is no reason why you should try to produce that much when your requirements are only half that amount.

I recommend the use of a flue gas analyzer, either recording or indicating according to the size of the plant, for by the use of this instrument it is possible to measure the amount of excess air used in burning the fuel. The CO_2 content of the flue gases will instantly enable you to figure out whether you are using the proper amount of air, or whether you are using two or three times as much as you need. You will find that as you increase the CO_2 you will increase the boiler efficiency, but be careful to note that it is not always the highest CO_2 that gives the best efficiency. What you want is the highest CO_2 that will carry the load.

The best average draft at the furnace ranges from two-tenths to three-tenths of an inch over the fire. It may be more or less than this in your plant. The more resistance that the grate and the fuel bed give, the greater will be the draft required. Air spaces in the grates vary, and the character of the coal on the grate also varies so that the draft problem should be worked out in each case with the use of a draft gage and gas analyzer.

As explained, excess draft is always provided, so that a check must be placed in the breeching to reduce the draft to the amount actually required to burn the coal with best results. The damper provides the means of adjusting the fuel consumption to the steam demands upon the boiler. Remember that all excess air entering the boiler or furnace must use enough heat units to raise its temperature from that at which it enters to that at which it passes out into the stack. With a good grade of coal, about 14,000 B.T.U., 50% excess air is usually figured the proper amount, but this may vary, depending upon other conditions. You can readily see that if the excess air is 250% that a serious fuel waste will take place. Insufficient air is sometimes found, but there is hardly one case in ten where lack of air is the trouble.

There is some draft that will carry your load most satisfactorily and burn your fuel with economy. The draft you should use will depend upon your fuel, your grate, your furnace, your load, etc. Find out what that draft is and then see that it is used.

Draft Control a Decided Necessity

The standard draft must be changed with the changes in the load conditions. Such changes should be made within limits to meet those conditions. As a rule, the dampers are set in a fixed position mostly by guess work, and while they may be right at the particular time they are set, they may be entirely wrong an hour from then, due to a decided change in the load conditions. The draft should be determined for each individual boiler, and each damper should then be operated to suit the load conditions, etc., as they change during the day. Check up the drafts you are using and see the great variety you employ.

One of the main factors dwelt upon by the Fuel Administration was the proper handling of the dampers for controlling the draft on boiler furnaces. Draft gages were recommended and in many cases installed. Gas analysis apparatus, either indicating or record-

ing, was brought into service, soot blowers and tube cleaners for cleaning heating surfaces were strongly recommended and installed, as were also recording steam gages, steam flow meters, coal weighers, and feed water meters. The particular value of all these instruments was merely to indicate the results, while in a few cases hand operation was required. This necessitated action on the part of the boiler room attendants and with the many duties of the present day fireman it is impossible for him to approach the sensitive control that is required, based on the indication of the instruments.

When a B.T.U., or heat unit, is liberated in the boiler furnace and turned wild, to harness it is like breaking in a broncho, due to the rapidity of its movement. You must pave the road for its travel and regulate its speed, or it will get away and be of little value. The efficiency of a boiler and its furnace depends upon proper draft, complete combustion, airtight settings, and clean heating surfaces. This means that a great amount of care should be taken in selecting suitable boiler equipment with sufficient combustion space, and that provision be made for a stack of the proper size and height and a breeching of proper area.

When a boiler plant is installed and tested, technical experts are employed by both the plant and the boiler manufacturer to see that correct and satisfactory results are obtained. As soon as the experts leave the job the efficiency drops because it is impossible for the fireman to do what it took several experts to do, and besides, he is not supposed to produce the same degree of intelligence as that of the technical man.

The same problem confronts the power plant operators in regard to automatic control of fuel feed and draft, as confronted them on feed water regulation several years ago. We now have an automatic feed water regulator which provides a continuous feed of water to the boiler, replacing the water as fast as it is evaporated into steam.

It is a well known fact that, in every boiler installation, dampers are provided for a definite purpose, and that purpose is to control the draft. The damper should always be controlled to suit the steam pressure. The fireman should not wait until the steam pressure drops several pounds and then open up the damper wide and throw in a heavy fire, nor should he wait until the steam pressure rises several pounds and then slam the damper shut. Such practice is usually resorted to where the fireman has to operate by a continual observance of the steam gage, and as the change in the latter is hardly discernible until there is a pound or more of variation, it is usually too late to check the onrushing fluctuation, resulting in a wide steam pressure variation. In many plants, they still use the old method of hand control consisting of a lever high up where the fireman has to climb to reach it, with the result that it is seldom touched. In other plants, a step of improvement has been made by providing chain connections, so that the dampers can be operated from the floor at some point distant from the front of the boiler, while in the more progressive plants attachments have been put into service so that the damper can be regulated from the front of the boiler with a draft gage to indicate the draft changes as they take place.

In spite of the latter conveniences, the fireman declines to use them, principally because the required changes present themselves so rapidly that he cannot keep pace with them along with his other duties which he considers more important.

The still more progressive plants have attempted a step of advancement by installing a damper regulator, which by means of a diaphragm and counter weights cause the automatic operation of the damper on a change in steam pressure of a pound or two. While this operation was better than by hand, in so far as the human element was concerned, yet it was not so good, due to the fact that with hand control the damper could be set at any point between the wide open and tight shut extreme, while the automatic regulator operated to the full extreme every time, being either wide open or entirely closed.

It is true that some regulators can be set so that the throw is limited, but even then the regulator operates between those limits, with the result that the wide open or tight shut condition still exists, and in most plants where these have been installed they are hanging on the wall out of commission.

The regulator which closes the damper tight shut, when the pressure is increased, turns the boiler furnace into a gas producer, which is apt to cause carbon monoxide in the fuel gas, and as soon as the regulator throws the damper to the other extreme, or wide open, this combustible gas is released through the boiler and out of the stack, causing fuel waste.

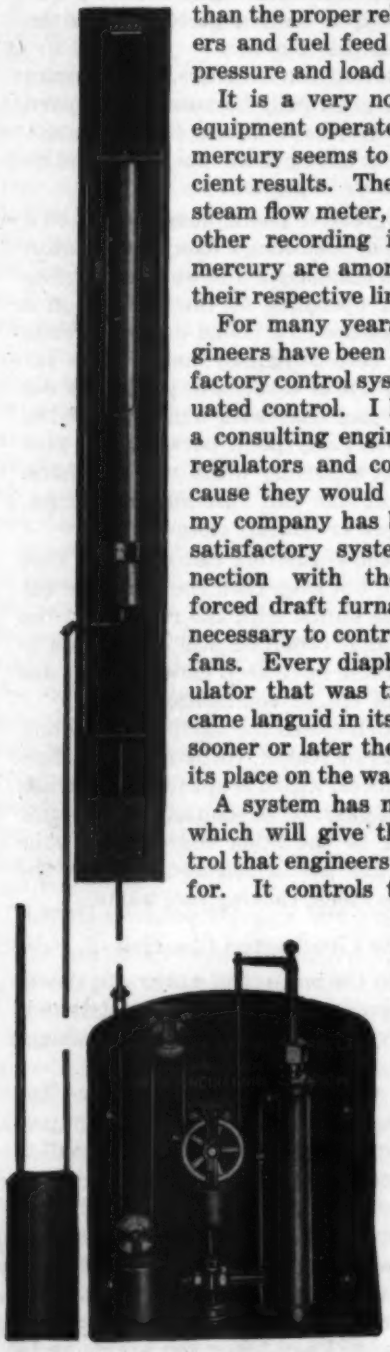
Automatic Graduated Control

This brings me to the subject of automatic power plant control on a graduated basis, a subject that is of interest to every power plant engineer, manager and superintendent.

Your boilers are equipped with steam gages. The fireman watches them as best he can. It is impossible for him to catch a change in pressure until it has reached a pound or more, and in a great many cases he does not see it until it has changed more than that. In a paper mill, you do not telephone the fireman and tell him that you are going to open up a steam line into the digester or some other part of the equipment; you just open the valve and expect that the fireman is going to know what you are doing by keeping his eye on the steam gage. These fluctuations are no doubt continuous throughout the day and it is physically impossible for your fireman to maintain anywhere near a constant pressure under the existing conditions, and if you have a recording

steam pressure gage the fluctuations in steam pressure are reflected upon that chart, but by the time you see it the damage is done and there is no chance to repair the loss.

There is no more vital point involved in the economical operation of the steam boiler than the proper relation of the dampers and fuel feed to suit the steam pressure and load conditions.



It is a very noticeable fact that equipment operated or controlled by mercury seems to give the most efficient results. The thermometer, the steam flow meter, vacuum gages and other recording instruments using mercury are among the foremost in their respective lines.

For many years, power plant engineers have been looking for a satisfactory control system to give a graduated control. I have known many a consulting engineer to turn down regulators and control systems because they would not graduate, and my company has been looking for a satisfactory system to use in connection with the installation of forced draft furnaces where it was necessary to control the forced draft fans. Every diaphragm type of regulator that was tried gradually became languid in its operation, so that sooner or later the equipment found its place on the wall, inoperative.

A system has now been designed which will give the graduated control that engineers have been waiting for. It controls the fuel feed and damper position jointly to correspond with the load, holding the proper relation for efficient results. Due to its graduated movement, it takes and holds any intermediate position that is required for the load carried, and instantly moves to a new position if there is a slight change in the load or steam flow, in the water, or in furnace conditions. This system maintains a proper relation between fuel and air supply by individual control of stoker engines, motors, dampers, oil burners, forced or induced draft fans. Instead of operating between the two extremes of wide open and tight shut, it takes the intermediate position between those points that is necessary for the load or condition at that time. This control system referred to consists of a master control with a barometric column of mercury, using the steam pressure to actuate the travel of mercury instead of atmospheric pressure. The column of mercury is two inches high for every pound of steam pressure, so that for every ounce of pressure change there is one-eighth of an inch of mercury travel.

Figure 3

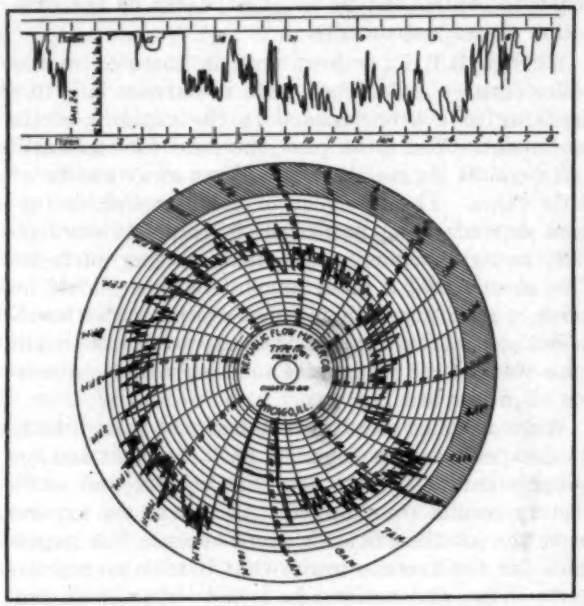


Figure 5

The mercury reservoir shown in the lower left-hand corner of Fig. 3 is connected with the upper mercury cylinder or well by a pipe line, and in the upper well is a free moving plunger which, by means of a yoke and side rods, is connected to the arm of the hydraulic cylinder, shown at the right-hand side of the lower panel. The chain connection between the floating plunger yoke and the hydraulic piston passes around the floating wheel lever or valve gear shown in the center of the lower panel. Just below this wheel lever, and directly connected to it, is shown a four-way pilot valve which controls the flow of water pressure either to the top or bottom of the hydraulic cylinder, depending on whether the steam pressure rises or falls, thus raising or lowering the piston of the pilot valve. It will be noticed that the wheel lever is free to move in a rotating motion as well as up and down, due to a slot provided in the bracket supporting the wheel. It will also be noted that the hydraulic cannot move until the pilot valve is opened, as until this is done there will be no water flow to move the hydraulic piston.

Assuming an increase in pressure, it will immediately increase the mercury in the upper well or cylinder; the plunger will rise just as soon as the change in pressure reaches one ounce, the movement being one-eighth of an inch. This will raise the wheel lever, slightly turning the wheel and at the same time raising the entire lever and valve piston, as the hydraulic must remain stationary until the above operation takes place. Immediately upon the piston of the pilot valve being raised, water from city pressure is admitted to the top of the hydraulic cylinder, causing the piston to move downward, lowering that side of the wheel lever and automatically returning the piston of the pilot valve to a neutral or closed position as soon as the hydraulic piston travels downward as far as the floating plunger travels upward, or, in other words, when the hydraulic is balanced against the mercury, which means balanced against the steam pressure.

When this balance takes place, the master control holds that position until there is another change in pressure. A drop in pressure operates just the reverse. The plunger is lowered, the piston of the pilot valve is lowered, water is admitted to the bottom of the hydraulic cylinder and the hydraulic piston moves upward, pulling the pilot valve piston back to neutral, when there is a balance between the plunger and the hydraulic.

The operation of the master is then transmitted to each individual auxiliary, there being one auxiliary for each individual damper, stoker engine or motor, forced draft fan, etc. These auxiliaries are all connected to the master by a strong tiller rope cable, or chain, and the connections are run through conduit pipes with special conduit pulleys so constructed as to make it possible to turn an angle of any degree.

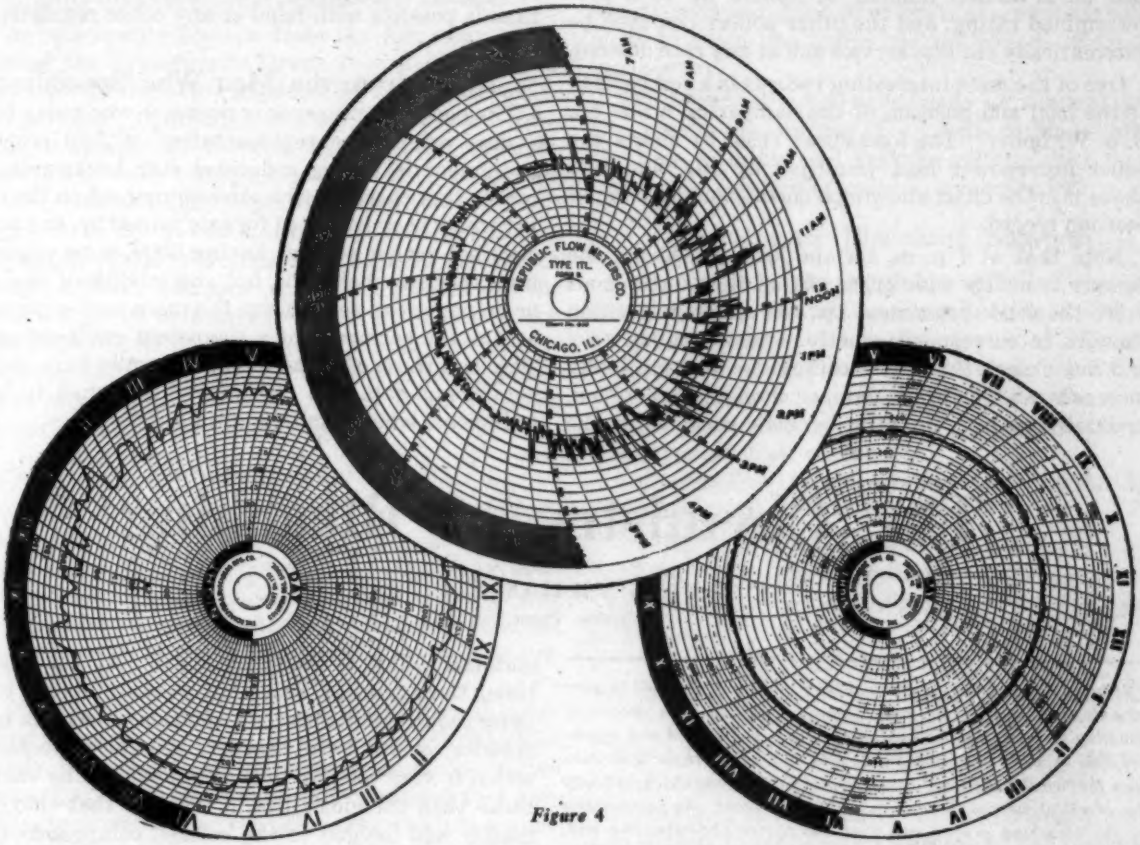


Figure 4

Where an auxiliary is installed, a special insert is provided so that a break can be made in the main conduit line and a branch cable taken off for the auxiliary. As the master moves, each auxiliary moves, thus giving individual control to each particular part of the equipment that enters into the combustion process.

The charts herewith show a comparison of load with steam pressure chart before and after installation of the automatic graduated control system (Fig. 4). The upper chart in the center shows the load conditions. The chart at the right shows the steam pressure chart from the same boiler for the same day. Note that the line is a floating line and does not show the saw teeth that are so characteristic with wide open and tight shut regulators. The range is set for five pounds, but any range can be obtained with the graduated control, due to the adjustment features which it has. The chart on the left shows

the pressure chart before the installation of graduated control was made.

One of the features of this graduated control is the adjusting set that is used on each auxiliary. By the means of this adjuster one boiler can be set ahead or behind any of the others, and the load can be carried on a certain number of boilers up to a predetermined rating, and the other boilers can then be automatically cut into service and at any rate desired.

One of the most interesting records is a comparison of the load and position of the damper on a 500 hp. B. & W. boiler. The load chart (Fig. 5) shows the boiler horsepower load (multiply by 10), and just above it is the chart showing a corresponding damper position record.

Note that at 7 p. m. for the load of 900 hp. the damper is nearly wide open. From then until about 8:30, the load diminishes and the damper position changes to correspond exactly. Also between four and five o'clock the next morning the load gradually increases, and again the damper changes its position, gradually opening up little by little until when the peak is reached the damper is in the right position to employ the rate of combustion that will enable the boiler to carry the load efficiently. The speed of the stoker has been increased in the same proportion so that the efficient relation between draft and fuel bed established for the grade of coal burned has been maintained automatically and with closer precision than is possible with hand or any other regulation or control.

Learn from the Men Who Specialize

The power plant owner or operator who today turns a deaf ear to the representative of fuel economy equipment is taking a decided step backwards. It is true that there may be some equipment on the market which is constructed for sale primarily, and which does not render service, having little or no engineering experience behind it, but any intelligent engineer or manager can select from the mass such equipment as has the earmarks of a competent engineering design, and those of greatest merit usually have enough convincing data and test matter attached to them to indicate what results might be expected.

The Chemistry of Bleaching

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It often happens that large quantities of bleach are used to poor advantage in many paper mills because those who have charge of handling this material do not always fully understand and appreciate its chemical characteristics. The following article is written with the belief that it will contain some informaton which will help the practical man in the mill to understand better the peculiarities of the bleaching process and that this better understanding will, in turn, enable him to discover for himself, many little ways in which he can increase the economy of the process.

IN order to understand the bleaching action, it must be borne in mind that practically all of the colored substances ordinarily met with are complex compounds of carbon, such as constitute the coloring matters of woods, plants, flowers, or artificial organic dyes. It must further be borne in mind that practically all—say ninety-nine out of every hundred—of the complex compounds of carbon are colorless, and that all the colored compounds containing carbon are included in the remaining 1 per cent. Now, if 99 per cent of the compounds containing carbon are colorless, it is evident that if a certain carbon compound happens to be colored and we change it chemically, the chances are ninety-nine to one that the new compound will be colorless. It will thus be seen that the problem of bleaching the colors ordinarily met with, resolves itself into finding a chemical which will, at least cost, introduce a chemical change into the color to be destroyed, without seriously affecting the material which is being bleached. At the present time, the chemical which, in general, seems to fill these requirements best is a solution of calcium hypochlorite, or its twin brother, sodium hypochlorite, which is very similar to it chemically. The value of these twin chemicals lies in the fact that they very readily add oxygen to the colored compounds (thus changing them chemically) while, under ordinary circumstances, they do not materially affect cellulose, the substance which largely makes up the fibrous portion of paper.

The chemical reactions taking place in the case of ordinary bleach liquor, calcium hypochlorite, may be expressed as follows:

$$2CaCl(OCl)+H_2SO_4=CaCl_2+CaSO_4+2HOCl$$

(Bleach liquor) + (Sulfuric acid) = (Calcium chloride) + (Sulfate of lime) + (Hypochlorous acid)

The hypochlorous acid thus formed breaks down according to the following equation, in the presence of the colored substance:

$$2HOCl+C.S.=O.C.S.+2HCl$$

(Hypochlorous acid) + (Colored substance) = (Oxidized colored substance) + (Muriatic acid)

It will be noticed from the equation that hypochlorous acid gives up both oxygen and hydrochloric muriatic acid. This acid re-acts with more bleach liquor in the same way as the vitrol, and forms hypochlorus acid which, in turn, breaks down to form more oxygen and more muriatic acid. It will thus be seen

that a very small amount of vitriol, or any other acid, will be sufficient to start the re-action. In fact, if time is no object, it is possible to dispense with the use of acid entirely, the small quantity of dissolved carbonic acid gas in the stock being sufficient to start the re-action.

Limitations of Hypochlorite Bleach

As will readily be seen from the foregoing explanation, the hypochlorite bleach is applicable only in cases where the new compound formed by its action is colorlesss. Ordinarily, this will be the case. However, it sometimes happens that rags, for example, are colored with mineral pigments such as chrome yellow, prussian blue, venetian red, or ochre. These pigments do not wash out of the rags readily, and usually cause no end of trouble when hypochlorite bleach is added; since the new compound formed by the bleach is often of a brighter color than that which was supposed to be removed. The same thing also happens, as most paper-makers know to their sorrow, when any quantity of hypochlorite bleach is added to stock containing ground wood.

The Manufacture of Bleach

As has already been mentioned, the papermaker's two main sources of bleach at the present time are (1) the so-called chlorinated lime (bleaching powder), which usually comes to the mill in 800 lb. iron drums, and (2) the electrolytic bleaching solution, which is made at the mill by passing an electric current through a solution of salt in water.

The manufacture of the chlorinated lime is a relatively simple process, which may be described briefly as follows: an electric surrent is passed through a water solution of salt contained in a specially designed box or cell; the salt, which is a compound of sodium and chlorine, is decomposed by the current into chloride gas and metallic sodium; the sodium, in turn, reacts with the water in the cell to form caustic soda solution and hydrogen gas according to the following equation:

$$2Na+2H_2O=2NaOH+H_2$$

(Metallic sodium)+(Water)=(Caustic Soda)+(Hydrogen gas)

This caustic soda solution is very energetic and will react with the chlorine gas to form sodium hypochlorite unless special precautions are taken in the designing of the cell to prevent the two coming in contact with each other.

As the chlorine gas comes from the cell, it is piped to gas tight chambers containing slacked lime spread out in thin layers on shelves. In these chambers, the following reaction takes place:

$$Cl_2+Ca(OH)_2=CaCl(OCl)+H_2O$$

(Chlorine gas)+(Slaked lime)=(Bleaching Powder)+(Water)

As soon as the lime in any one chamber has absorbed the proper quantity of chlorine, the gas is turned into another chamber, and the bleaching powder loaded into iron drums for shipment. The caustic soda solution coming from the cell is concentrated and sold as a valuable by-product. The electrical requirements of this process are rather high, a kilowatt-hour of electrical power producing only about .8 lbs. of caustic soda and .7 lbs. of chlorine gas, which is equivalent to about one and a quarter pounds of bleaching powder.

The bleaching solution is made at the mill from the powder by stirring it up with water, allowing the lime to settle, and drawing off the clear liquor, which is a solution of calcium hypochlorite.

Electrolytic Bleaching Solution

Comparatively recently, many mills have adopted the plan of making a bleaching solution at the mill by electrolyzing a solution of common salt. The electrolyzer, or cell, in this case is of an extremely simple design, since it is not necessary to keep the caustic soda solution and the chlorine gas from coming in contact with each other.

The chemical reactions taking place in this type of cell may be expressed as follows:

$$2NaCl+\text{Electric current}+\text{water}=Na+Cl_2$$

(117 lbs. salt)=(46 lbs. sodium)+(71 lbs. chlorine)

The metallic sodium immediately acts upon the water as follows:

$$2Na+2H_2O=2NaOH+H_2$$

(46 lbs. Sodium)+(36 lbs. Water)=(80 lbs. Caustic soda)+(2lbs. hydrogen gas)

Since there is nothing in the design of this type of cell to keep the caustic soda solution and the chlorine gas apart, they instantly react to form salt, water, and sodium hypochlorite according to the following:

$$2NaOH+Cl_2=NaOCl+NaCl+H_2O$$

(80 lbs. Caustic)+(71 lbs. Chlorine)=(74 lbs. sodium hypochlorite)+(58 lbs. salt)+(18 lbs. water)

It will be seen from the above equations that 117 lbs. of the original salt should produce about 74 lbs. of the sodium hypochlorite. This hypochlorite is an excellent bleaching agent, and is very similar to the calcium hypochlorite solution obtained when bleaching powder is mixed up with water. Tests show, however, that the sodium hypochlorite is the more efficient bleaching agent of the two. Among the advantages arising from the use of the electrolytic solution are (1) the strength of the solution is easily controlled, (2) the salt, from which the solution is made, does not deteriorate on standing in storage, (3) there is no troublesome, disagreeable dust or sludge connected with the use of this solution, and (4) the solution is neutral and much more soluble than the calcium hypochlorite. It is a question which must be decided by each mill individually whether the advantages mentioned will warrant the cost of

installing and operating the electrolytic bleaching solution apparatus.

Apparatus for the Testing of Bleaching Powder

In mills where bleaching powder is used, it is a matter of some importance to test the material when it arrives at the mill. The test is a comparatively simple one and can be carried out with a small expenditure of time and money, even in mills which do not employ a chemist. The apparatus required is as follows:

One prescription balance, accurate to ten milligrams (m. g.)
One set of weights from above (10 m. g. to 50 grams.)
One 20 cubic centimeter (c. c.) weighing bottle.
One 8-oz. wide mouth sample bottle, with stopper.
One 1000 cubic centimeter (c. c.) volumetric flask.
One burette with holder (50 c. c. capacity).
One glass mortar with pestle.
One common drinking glass and glass stirring rod.
One oz. dry powdered arsenic trioxide (pure).
One pound sodium carbonate (pure).
One fourth oz. potassium or sodium iodide.
One small package starch.
One 25 c. c. and one 5 c. c. volumetric pipette.

The total cost of this apparatus should be about twenty to twenty-five dollars.

The arsenic trioxide and sodium carbonate mentioned above are used to make up what chemists call a standard tenth normal arsenite solution. The instructions for making up this solution are as follows: Weigh out exactly 4.95 grams of the dry powdered arsenic trioxide into the liter flask; to this, add about 30 grams of pure dry sodium carbonate and 200 cubic centimeters (c. c.) of distilled water or clear rain water; boil and shake the solution gently over a gas flame, alcohol burner, or electric heater until all the powder has dissolved; cool the solution and dilute it up to the one liter mark with distilled water or clear rain water. One cubic centimeter of this solution, as measured by the burette, should react with exactly .00355 grams of available, or active chlorine.

Iodide of starch test paper is made up by adding about a gram of potassium or sodium iodide, dissolved in water, to a half pint of thin starch paste. Strips of unsized paper, such as filter paper, are moistened with this solution and allowed to dry, out of contact with chlorine fumes. As soon as the strips are thoroughly dry, they are placed in a tightly stoppered bottle and kept for future use.

Instructions for Testing Bleaching Powder

In testing bleaching powder, three drums of the powder from the car are opened, upon its arrival at the mill, and immediately a sample of at least four ounces is drawn from the three drums; care being taken to put the sample at once into the sample bottle provided for the purpose.

A convenient device for drawing the sample from the drums can be made from a three or four foot length of one inch angle iron by grinding one end to a point, and affixing some sort of a handle to the other end. In sampling bleach with this device, it is only necessary to punch a small hole in the drum, insert the sampler into the bleach, give it a complete turn, and withdraw it. One or two samplers full should be a sufficient quantity to draw from each drum.

The sample from the three drums should be tested as soon as possible after drawing. This requires a little care and is accomplished as follows: the sample in the large bottle is shaken until it is thoroughly mixed and no lumps remain; the stopper is removed and the weighing bottle, which has previously been dried and weighed, is filled about half full with the powder; the weighing bottle is stoppered and again carefully weighed, the difference between the two weights being the weight of sample for analysis; this difference should be about 10 to 15 grams; the contents of the weighing bottle are now rinsed into the mortar along with enough water to about half fill the latter; the bleach is carefully ground in the mortar and then rinsed into the 1000 c. c. measuring flask, along with enough water to fill the flask up to the mark on the neck; care being taken, of course, not to lose any of the bleach; the flask is shaken thoroughly and exactly 25 c. c. of the turpid liquor transferred by means of the pipette, to a small drinking glass or beaker; after adding an inch or so of water to the glass the sample is ready for titration.

As the first step to this operation, the burette is filled to the top with the standard arsenite solution, the stop cock is opened, and the liquid allowed to run out until the bottom of the meniscus of the liquid stands at the O c. c. mark. The glass containing the diluted bleaching solution is now placed underneath the burette and the arsenite run in slowly while the solution in the glass is stirred constantly. As soon as 20 c. c. of the arsenite have been run in, a drop of the solution in the glass is transferred, by means of the glass rod, to a piece of the test paper. The formation of a blue spot on the test paper shows that not all the bleach has been destroyed by the arsenite. The standard solution is now run in a half a c. c. at a time, a drop being placed on the test paper after each addition, until a point is reached where the sample drop no longer produces a colored spot on the paper, showing that all the bleach has been destroyed. At this point, the number of c. c. of standard solution used is read from the burette, taking care that the reading is taken at the bottom of the meniscus. The test is then checked by taking a fresh 25 c. c. sample of the liquor from the flask, care being taken to refill the burette and to agitate the solution in the flash before drawing the sample. Of course, on the

second trial, very nearly the proper amount of arsenite solution can be run in before any of the solution being titrated is tried on the test paper. As the end point is approached, as shown by the lightening shade of the spot on the test paper, the arsenite is run in drop at a time, the solution in the glass being tested after each addition, until the faint blue spot on the test paper finally disappears entirely. The burette reading at this point is taken as final, and the results calculated by the following formula:

$$\frac{B \times .00355 \times 100}{(A-W) \times .025} = \%\text{ of available chlorine,}$$

where "B" is the final burette reading in c. c.

"A" is the weight of the weighing bottle plus the sample in grams.

"W" is the weight of the weighing bottle empty, in grams.

.025 stands for the 25 c. c. sample of liquor drawn for titration.

A good bleaching powder should test from 34 to 38% available chlorine.

The Testing of Bleaching Liquor

Bleaching liquor may be tested either by means of the hydrometer or by titration as described above. While the hydrometer by no means gives an accurate test, it offers a simple, rapid method of finding the approximate strength of a bleaching solution. In cases where any degree of accuracy is desired, however, the titration method must be resorted to. The procedure is practically the same as described for testing the turpid solution made from the bleaching powder. In this case, exactly 5 c. c. of the clear bleach liquor is transferred to the titrating glass by means of the small 5 c. c. volumetric pipette, and standard arsenite solution is run in from the burette until the bleach has all been destroyed, as shown by the test paper. If accuracy is required, this is followed by a check test, and the burette reading taken very carefully. The strength of the bleach liquor is calculated from the burette reading by means of the following formula:

$B \times .00593 =$ lbs. of available chlorine per U. S. Gal. of liquor

$$\frac{B \times .00593}{.35} = \text{lbs. of bleaching powder per U. S. Gal. liquor}$$

where "B" is the final reading of the burette in c. c. and where 5 c. c. of the bleach liquor is titrated.

This method of testing liquor may be used equally well on either the lime bleach or the electrolytic "soda" bleach. At first, it may be rather difficult to handle the burette and pipettes; but after a little practice, a complete test on bleaching liquor can be made in from three to five minutes.

Hints on the Use and Testing of Bleach

Below are given a few hints or "nevers" which may appear simple to most mill men; but which are well worth noting, as the writer has learned by experience.

NEVER disregard the importance of cleanliness while testing bleach and bleach liquor.

NEVER forget that bleaching powder deteriorates rapidly when standing exposed to air.

NEVER expect to obtain more than an approximate value when testing bleach liquor with the hydrometer.

NEVER fail to realize the importance of controlling the strength of bleach liquor.

NEVER entertain the opinion that it will not be worth while to carefully watch and check up the bleach consumption.

NEVER forget that an excessive use of bleach is equivalent to an excessive waste of bleach.

Large Company to Reforest

One of New York State's biggest private planting plans has been worked out in St. Lawrence county, with the decision of the National Paper Products Company of Carthage, N. Y., to reforest a tract of 1,700 acres near Streeter Lake, near Star Lake. The first planting will be done the coming spring. The first work will naturally be on a small scale, only about 75 acres of planting being planned. After the work is once started, however, the company plans to go ahead on a big scale and get the entire tract planted as soon as possible.

The entire preparatory work has been done by the State Ranger School at Wanakena of the New York State College of Forestry, under the direction of Director Robert Craig, Jr., who had charge of a ten day engineering job done by last year's class of the Ranger School. The preliminary survey was made, and the working plans prepared, and the plans have been accepted by the company, which is now preparing for work as soon as weather permits.

The first task was the making of an accurate topographic map of the tract, and the Ranger School students, because of the importance of the project, put a large amount of careful work into this survey. The working plan provides for complete planting of the entire acreage, in order that the company may have growing a supply of timber as raw material for future operations.

The company is nationally known, for though its head office is in Carthage, it has branches as far distant as San Francisco and Seattle.

Slamming your competitor is like slamming a punching bag: If anybody gets hit on the nose, it will be you.—Douglas Malloch.

Paper Machinery

Its Development and Latest Improvements

By C. T. RAMSDEN
Beloit Iron Works

Presented at the April Meeting of the Michigan Division

THE subject of Paper Machinery is nearly as complicated as the subject of Paper Making. In fact, those of us who are engaged in it, often think it is more so. The paper machine builder not only has to know a great deal about the process of making paper, but also has to have a considerable amount of engineering ability to adapt the individual ideas and needs of the customer and particularly the customer's superintendent to certain acknowledged standards in the design of the paper machine. He then has to transform his ideas from paper to iron or brass, and the field, therefore, resolves itself into two distinct ones, each of which is a complete unit in itself.

Before going into the subject of improvements on the paper machine, it might be of interest to the paper makers to know of the improvements the machine builder himself has made. When the business was more or less in its infancy, methods, systems, and the machine itself were crude. For many years, the patterns used were not even symboled; jigs, templates and fixtures were in negligible quantities, and there were no real standards set up, as there are today.

Drawings of the machine, while generally works of art in so far as beauty was concerned were not of much use after the machine had been built a few years, as they were not made in sufficient detail to be useful as records.

Today the drawings of a machine, while not beautiful, are sources of a mass of detailed information. Every piece on the machine is symboled. Every assembly of small parts has a complete drawing giving every measurement and detail. Every pattern has a pattern drawing and is symboled. Carrying the thing still farther, the machine shop abounds in jigs and templates whereby it is possible to duplicate parts with amazing accuracy.

To give one some idea of our firm's side of the business and a few of its intricacies, we have today nearly 20,000 different patterns which along with their respective drawings represent an actual investment of over half a million dollars. You can see, therefore, that great improvements have been made along the mechanical end of the proposition due entirely to the paper machine builder, but certain refinements and methods have to be left to the superintendent to decide and to furnish the guiding light. This is the reason why the machine builder is so dependent on the paper mill superintendent for new ideas; and also because the superintendent has to operate the machine that the builder has made for him.

It is quite difficult to trace the various improvements as they have been made for everything has been a gradual outgrowth. There have been no great or radical steps taken at one time. It has been simply a question of gradual evolution.

Therefore, it may be of interest to compare the machine of thirty years ago with that of today.

Some Comparisons

The cylinder machine of that time was a small affair sixty inches wide and less, one cylinder, one press, five or six dryers arranged in single deck, a small stack of calenders, reel and cutter. The whole machine could be loaded into one or at the most two cars, and was good for three or four tons of paper per day. Compare this if you will with the modern cylinder board machine with seven or eight cylinders, six or seven primary presses, three or four main presses, perhaps one hundred and twenty or more dryers, three stacks of calenders, cutter, winder, etc. One of these monsters trimming up to 160 inches requires seventy cars to ship it and will produce up to 150 tons of board per day.

This gives one rather a sketchy idea of the development of this kind of machine. To take up the matter more in detail: The old wood vat for the cylinder has given way to the iron-end and all-iron vat—which was a necessity owing to increased width of the machine and the consequent greater weight on the various parts.

The flimsy cylinder was displaced by the rugged mould having a twelve-inch cast iron center shaft with large brass spiders securely fastened thereto—eliminating all tendency to sag; the crude lignum vitae bearings inside the vat and in the water, displaced by the modern ball bearing and water proof housing—which enables the mold to turn so easily that the force of the water from a shower pipe will readily keep it revolving; the old iron press rolls replaced with rubber and gun metal covered rolls and so on through the entire machine.

We see the greatest change, however, in the drive. How many of our older friends remember the straight face pulleys belted together with each section of the machine, and the grief they had! Every time a change of weights in the sheet was made, every time

the stock varied, it meant going to the back side and by means of strips of canvas and lagging wax, lagging up one pulley, or shutting down and cutting some off another. Then some ingenious man devised the expanding pulley which, while an improvement, certainly had its vagaries and generally wound up by flying to pieces. Then came the more modern Marshall drive with which most machines today are equipped. The position of this drive, however, is threatened with the advent of the rope drives and the sectional electric drives of which more will be said later. These, however, we imagine will be slow to displace the Marshall drives on cylinder machines on account of the slow speed at which these machines run.

The Yankee Machine

Up until 1891 there were no Yankee paper machines in operation in this country. The few that were running were located in England and Germany. In that year, the first machine was built for the Thilmany Pulp & Paper Company at Kaukauna, Wis.

This was an 80-inch machine with a wire 28 feet long, one pair of presses with a 78-inch diameter dryer mounted above and riding directly on the top press roll. This machine was designed primarily for eight-pound fruit wrap and produced about two tons per day.

The same company installed more machines of the same type and after they had proven their success other concerns began installing them.

These machines were used only on light weights until 1910 or 1912. As they were entirely automatic, they were a very desirable proposition on light weights. The machine glaze feature was overlooked to some extent on the heavier weights as the machine's greatest usefulness was on fruit wrap, because fruit was wrapped by hand and the rough side facilitated quick work.

About 1912 the trade began to demand M. G. papers in the heavy weights, and the first concern to devote its entire attention to this class of paper on the Yankee was the Marathon Paper Mills Company, and great praise should be accorded that firm and its superintendent, W. A. Kelly, for developing this grade of paper and also securing production on the machine.

They introduced several novel features on the Yankee, designed especially for heavy weights.

The modern Yankee with a 132-inch wire will produce from seventeen to twenty tons of paper per day on certain weights.

The common arrangement at present is to have a wire 45 feet long to 50 feet long, one press and one pressure roll, the latter pressing the sheet against a 10-foot diameter dryer. The limit, in so far as production is concerned, lies, strange as it may seem, with the railroads.

Although it would be possible from the builder's standpoint and desirable from the viewpoint of the paper mill to make a larger diameter dryer, yet the railroads will not accept anything over 10 feet in diameter, and until some means can be arranged for shipping larger dryers the drying capacity is practically at its limit today, although air absorption systems have recently aided drying materially.

The machine has great versatility, however, and can handle anything from a two-pound sheet, as it did during the war in the manufacture of cellu cottom, up to a hundred-pound or even heavier sheet, and with a stack of calenders and proper sweating of the rough side can make virtually a two-side finish sheet.

The Straight Fourdrinier

In this type of machine we find what we may term the more spectacular improvements, principally in the matter of speed. A few weeks ago, the writer happened to be going over some old contracts and among them ran across one covering a newsprint machine. That the contract was of ancient vintage was evidenced by the following clause:

"We will arrange this machine and guarantee its performance for a speed up to 125 feet per minute provided that good stock and able machine tenders are furnished by the purchaser."

(Note the proviso introduced by a cautious machine builder.)

Today there is one machine in the country running at better than 900 feet of newsprint per minute and a number being built that, it is hoped will attain a speed of 1200 feet or better.

When one begins to get into this field, an entirely new proposition is presented and one practically unlimited in scope. It is necessary to scrap many old ideas and seek these new fields without former prejudices or too many set rules of past performance.

As an instance, take the matter of table rolls. When the machines began to get up to 500 feet or more, it was found that the old standing balance given them was not sufficient. Therefore, they were placed in a running balance of from 600 feet to 700 feet. Now to get up to the speeds talked of today, it will be necessary to introduce what we might call a super-running balance.

Then take the matter of bearings—the time of the oak block and piece of pork rind are past; perhaps due to the price of pork, but more likely to the fact that progress demands refinements. We, therefore, find ball and roller bearings on breast table wire and felt rolls, more or less complex and refined plain bearings for press, dryer, and calender rolls.

Then comes the oscillating suction box which prevents the wire from grooving the cover, thereby saving the wire to an appreciable extent and cutting down the time generally devoted to dressing the covers.

Most of you are familiar with the suction rolls of today and their attendant advantages over the old

couchers, on nearly all grades of paper. The suction roll, while an acknowledged improvement and gaining in popularity, is still in its infancy and has an enormous field in which to develop. Great things may be expected of it in years to come.

Passing the Sheet Automatically

As the machines began to speed up, the matter of passing the sheet by hand became more serious. In some mills, where speed was in vogue, it was often necessary to slow down when a skilled back-tender was absent. One of the most dangerous and particular jobs was the passing of the sheet through the dryers. A few years ago Mr. William Sheahan developed an automatic feed comprising two parallel ropes running close together on sheaves attached to the front end of the dryers. The back-tender simply threw the tail between these ropes at the press end, and the sheet was carried through, automatically, to the calender end.

A still further improvement, and what is today the last word in paper passing, was developed by Mr. C. Elmer Pope. He uses compressed air and blows the sheet off the couch and pressed, through the dryers and calenders and into the reel. The back-tender does not touch the sheet at any time, and the ease with which this device works is wonderful.

Development in Drives

In the first part of this paper we referred to the drives on paper machines and it is well to consider them now more fully. When high speeds became more and more common, the matter of drives became serious and complex. On the older machines the drives were back geared, as they are today on cylinder machines.

As the speeds increased, the pulley and clutch speed, we are now referring to the Marshall drive, became excessive. To remedy this, it was only necessary to remove the back gears and slow down the variable line. This remedy, however, was only temporary, for upon further speeding, the pulleys began to exceed their safe limit. The gear ratios in the bevel gears were then cut down to secure lower pulley speeds, and this necessitated installing larger friction clutches.

Upon the introduction of still greater speeds, the clutch problem proved a source of trouble. Picture if you can the requirements of a clutch that would be necessary to bring a huge dryer section, a dead weight of perhaps 200 tons, up to 1000 feet per minute speed from a dead rest. A good clutch will do it for a short time, but thereafter, repair bills begin to mount.

To overcome these troubles, we have to confess that American builders and paper mill men had to borrow from Germany and England where rope drives were in use a long time ago.

To those who are not familiar with this kind of drive, it might be well to digress a few minutes and explain the various rope and belt drives that are in use.

One kind, known as the Hardy S. Ferguson drive, used the conventional line shaft in the basement. This was belted up to pedestals at each section with cone pulleys, with a clutch and then by means of a quarter twist belt and mule or idler pulleys in the basement the power was transmitted to a pulley driving a section of the machine.

Again there is the straight rope drive of which there are a number of types. All of them eliminate the line shaft, and an engine or motor drives, by means of ropes, sheaves and pulleys located at each section of the machine. One system drives from the section sheave through cone pulleys and clutches in the basement directly up to the various sections. Perhaps the most simple is the Lloyd Hutchinson Patent Drive which has the advantage of entirely dispensing with friction clutches. This type has a rope sheave under each section, driven by the source of power, and on the same shaft with the sheave is placed a comparatively small taper pulley. This drives up to a large taper pulley on the machine room floor, and this in turn is mounted on the drive inshaft of the particular section. The rope sheave and small pulley in the basement are held in a rocking cradle. When the machine is started, this cradle is lowered and the small cone pulley gradually comes in contact with the belt and starts the machine. When the machine is stopped, the cradle is simply raised, lifting the pulley out of the loop of the belt. It acts on the same principle as a belt tightener.

The position of these drives, however, is somewhat unstable, when extremely high speeds are encountered, owing to high rope and pulley speeds; and the consequent punishment of belts, but mainly with the coming of the sectional electric drive.

This kind of drive, built by a number of electrical concerns, of course, eliminates ropes, belts, gears and clutches, and, no doubt, we shall see great developments in it in the next few years.

All of these drives are more or less alike and vary only in the method of control. Each section is driven direct with its individual variable speed D.C. motor. One system has a synchronous motor, that by means of an exceptionally sensitive rheostat, controls each D.C. motor. Another system has, in addition to the direct current variable speed motor driving the section, a synchronous A.C. motor also attached to each drive. All of the synchronous motors are wired together in such a fashion that when one D.C. motor starts to get out of tune the synchronous immediately corrects it. Another system which appears more complicated depends on a light line shaft running the length of the machine, driven by a small synchronous motor. This shaft through bevel and equalizing gears correct the speeds of the large D.C. variable speed motors.

Combustion Losses and Their Minimization

By ROBERT JUNE, M. E.

This is the third in a series of articles by Mr. June on Power Plant Management. Succeeding articles deal with Combustion Problems, Use of Instruments, Mechanical Stokers, etc. Later papers discuss Abuse of Steam, Bonus Systems, Human and Business Management Problems.—Editor.

THE raw materials of combustion, coal and air, are composed of a number of elements, which must be taken into consideration in arriving at an understanding of the cause of waste. Coal consists largely of carbon, hydrogen, oxygen, sulphur and earthy material or ash. Air is made up principally of oxygen, nitrogen and water vapor. In the furnace, these elements behave in the manner shown in Table I.

TABLE I

Name of element	Chemical symbol	What happens in the furnace	Combines with oxygen to form	Amount of oxygen required to burn	Amount of air in lb. required to burn	Heat developed by complete burning of 1 lb.
Carbon	C	burns	CO	2.66	11.57	14,000
Hydrogen	H	burns	H2O	8.0	34.80	62,000
Oxygen	O	burns	....	...	....	.....
Nitrogen	N	burns	....	...	....	.....
Sulphur	S	burns	SO2	1.0	4.35	4,050

If carbon and oxygen are brought together at a high temperature, 12 parts of carbon will unite with 32 parts of oxygen to form 44 parts of carbon dioxide, which means that 2⅔ pounds are required to burn 1 pound of carbon dioxide.

Our only source of oxygen is the air, which is composed of 23 per cent of oxygen, and 77 per cent nitrogen by weight, so that to supply 1 pound of oxygen to the coal we must use $\frac{100}{23}$ = 4.35 pounds of air, which includes $\frac{77}{23}$ = 3.35 pounds of nitrogen.

In order to burn completely 1 pound of carbon, 2⅔ pounds of oxygen are required and 3⅔ pounds of carbon dioxide are formed.

As 3.35 pounds of nitrogen are introduced with every pound of oxygen, it follows that for 2⅔ pounds of oxygen, 8.92 pounds of nitrogen are used.

The result of burning 1 pound of pure carbon in air is therefore

3.67 pounds of CO_2
8.92 pounds of N

12.69 pounds of flue gases.

As the ash in coal requires no air, and hydrogen is present in but minor quantities, the theoretical amount of air required to burn carbon is approximately that required for the complete combustion of the coal—that is 12 pounds of air in a perfect furnace.

In the actual furnace, it is necessary to supply more than the theoretical amount of oxygen. The percentage of excess air depends upon the sizes and character of the coal, kind of furnace and grates, depth of fuel bed, method of firing, draft and other variables. But it may be set down as an axiom that where much over 40 per cent excess air is used for combustion, there is something radically wrong.

The cooling effects of various percentages of excess air are indicated in Table II.

TABLE II

Percentage excess air	Theoretical temperature of combustion deg. Fahr.	Loss of temperature due to excess of air deg. Fahr.	Loss expressed in terms of percentage	Relative boiler capacity assuming 40% excess air as normal attainable practice or 100%
0	5132	0	0	....
10	4710	422	8.2	....
20	4352	780	15.2	....
30	4044	1088	21.3	....
40	3777	1355	26.4	100
50	3543	1589	31.0	93.5
60	3336	1796	35.0	88.2
70	3153	1979	38.6	83.5
80	2988	2144	41.4	78.5
90	2840	2292	46.7	74.5
100	2705	2927	47.3	70
125	2419	2713	52.9	63
150	2188	2944	57.4	56.6
175	1997	3135	61.1	51.1
200	1837	3295	64.2	47.0

So far as concerns the efficiency of steam production, it would make no difference at all what the temperature of the fire was or whether 12 pounds or 120 pounds of air were used for each pound of coal, so long as the fuel were completely burned and the boiler surface large enough to absorb all the heat in the gases. If we had an ideally perfect boiler that could absorb heat from gases until they were cooled

down to air temperatures, we would not care how much air had been used to burn the coal, nor what the temperature of the gases was, because all their heat would be absorbed. Unfortunately, it is not only impossible, but impracticable, to build boilers of this kind. Heat cannot be absorbed effectively by a boiler from flue gases which are much cooler than 500 to 600 degrees Fahrenheit. Furthermore, this temperature is usually required to produce the neces-

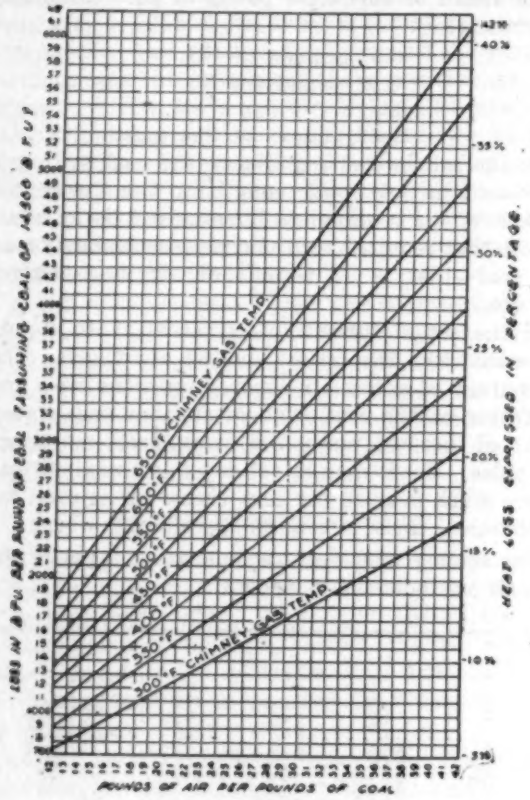

Fig. 1

sary draft, and unless the quantity of gas is kept down to a small volume, the draft will be impaired because of the friction loss due to the resistance of fuel, boiler and chimney.

Hot Gases Are Waste Product of Boiler Plant

With the actual boiler then, it makes a great deal of difference whether 12 pounds or 120 pounds of air are used to burn 1 pound of coal. In one case 13 pounds of hot gas are going up the chimney, and in the other case, 121 pounds. These hot gases are the chief "waste product" of the boiler plant or steam factory, and they constitute the largest item in the total waste of 40 per cent occurring in the average plant. Evidently the loss due to heat carried away by this waste product, is reduced by taking only the minimum amount of air. But just as the factory manager must keep tab on his waste in order to eliminate it, so must the engineer measure the amount of waste product in order to take steps towards its reduction. The amount of chimney gases per pound of coal is obtained by measuring CO_2 or carbon dioxide; the heat in each pound of these gases is measured by their temperature. We will consider briefly all of the important causes of loss in a boiler plant and point out their extent and, if possible, how each loss may be reduced.

Heat Losses in Burning Coal

A boiler, in order to utilize entirely the heat of combustion of the fuel, must be free from radiation and leakage losses, the fuel must be completely oxidized and the products of combustion must be discharged at atmospheric temperatures. Commercially, such conditions are unobtainable, hence complete utilization of the heat generated is impossible. A boiler which utilizes 83 per cent of the heat value of the fuel is exceptional, and an average figure for very good practice is not very far from 77 per cent. The various losses, including the heat utilized by the boiler, constitute the commercial "heat balance." The losses considered are:

1—Loss in the dry chimney gases.

2—Loss due to incomplete combustion.

3—Loss of fuel thru the grate.

4—Superheating the hygroscopic moisture in the air.

5—Moisture in the fuel.

6—Loss due to the presence of hydrogen in the fuel.

7—Unburned fuel carried beyond the combustion chamber in the form of soot or smoke.

8—Radiation and minor losses.

Some of these losses are preventable. Others are inherent and cannot be avoided.

Loss in the Dry Chimney Gases

This loss depends upon the type and proportion of the boiler and setting, and upon the rate of driving. It is usually the greatest of all the losses. The amount of heat carried away under varying conditions is shown graphically in Figure I.

It will be noted that the magnitude of this loss depends chiefly upon the air dilution and the temperatures at which gases are discharged. Flue temperatures less than 450 degrees Fahrenheit are seldom experienced, except in connection with economizers, and as the air dilution is ordinarily well over 40 per cent, the loss from this cause may range from 8 to 40 per cent of the total heat generated.

The amount of this loss can be cut down by reducing the weight of the heat bearing gases, by only admitting to the furnaces the minimum practical amount of air, by preventing leaks in the furnace setting, and by reducing the temperature of the gases by keeping the fire surfaces of the boiler clean through the use of mechanical soot blowers.

CO_2 analysis apparatus is invaluable in determining this loss and furnishing a basis on which to lessen it.

Losses Due to Incomplete Combustion

If the volatile gases are not completely oxidized, as when the air supply is insufficient or the mixture of air and gases is not quite thorough, some of the carbon may escape as CO. Some of the hydrocarbon may also pass through the furnace without being burned. The presence of even a small amount of CO in the flue gas is indicative of appreciable loss, as will be seen from Figure II.

If the furnace is properly designed, these losses may be reduced to an almost negligible quantity by careful operation. With a good and even fire bed, having a thickness suited to the effective draft, only traces of CO, hydrogen, etc., should be found. If the losses exceed 2 per cent, there is something wrong and pains should be taken to find out whether the trouble is due to poor design or careless firing, so that it can be eliminated.

Loss of Fuel Through Grate

In average practice, the unconsumed carbon found in the ash pit ranges from 15 to 50 per cent of the total weight of dry refuse, depending upon the size and quality of the coal, type of grate and rate of driving. This loss of fuel runs from 1.5 to 10 per cent, or more, of the total heating value. Although various attempts have been made to assign an average percentage to this loss, they have been without result or value. Numerous tests of recent mechanical stoker installations have indicated losses ranging from 1.5 to 5 per cent of the heat value of the coal at normal rates.

Loss Due to Superheating Moisture in the Air

This loss is, in the main, a minor one, ranging from 0.2 to 0.4 per cent, except on hot, humid days or at plants located at points of excessive rainfall or near the sea coast. As it cannot be controlled, except as the excess of air is controlled, it is not discussed further.

Loss Due to Moisture in Fuel

Moisture in the fuel represents an appreciable loss in economy if present in large quantities, since the heat necessary to evaporate it into superheated steam at chimney temperature is lost. Firemen occasionally wet coal to assist coking or reduce dust, but moisture thus added necessarily reduces the theoretical furnace efficiency.

Under certain conditions, wet coal may give a higher evaporation than dry coal, that is, through a purely mechanical action the moisture may assist in packing the coal, thus reducing the loss through the grate, or in cases of thin fires, reduce air excess. The occasions when the application of the hose to the coal pile is warranted are of limited frequency, however, and firemen should be under strict instructions never to apply water without the specific consent of the boiler-room foreman.

It follows, from what has been said, that coal known to be high in moisture, should not be purchased without adjustment of price to compensate for lowered efficiency.

Loss Due to Presence of Hydrogen in Fuel

That part of the hydrogen in fuel which is in a free state, burns to water and in so doing, liberates 62,000 B.t.u. per pound. Unfortunately, all of this heat does not become available for producing steam since the water formed by combustion is discharged by the flue gases as superheated steam, at chimney temperature. This loss is inherent. With anthracite, it is approximately 2.5 per cent of the heating value, and with bituminous, 4.5 per cent.

Loss Due to Visible Smoke

The loss due to smoke is very visible, but it cannot be weighed or measured and is generally overestimated. Smoke consists of carbon, in a flacculent state, and ash mixed with the products of combustion.

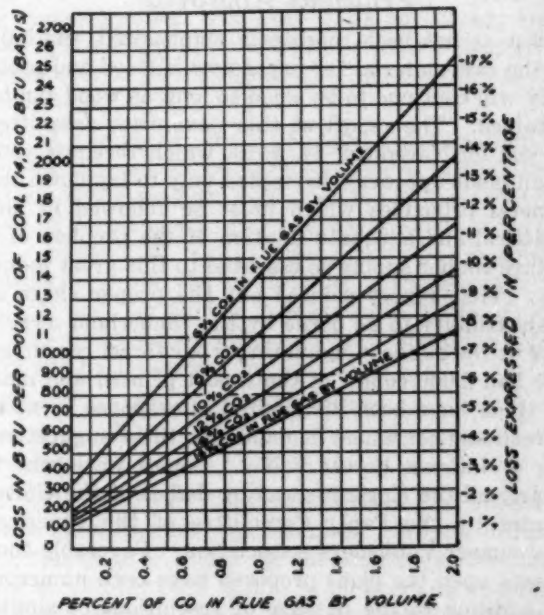
LOSS IN BTU PER POUND OF COAL (14,500 BTU BASIS)
LOSS EXPRESSED IN PERCENTAGE
PERCENT OF CO IN FLUE GAS BY VOLUME
9% CO2
10% CO2
12% CO2
14% CO2
0.2% CO IN FLUE GAS BY VOLUME

Fig. 2. Showing the Loss of Heat Due to Incomplete Combustion Which is Indicated By the Presence of Carbon Monoxide in the Flue Gases.

The losses due to visible smoke seldom exceed 1 per cent. It must be remembered in considering this loss that a smoky chimney does not necessarily indicate an inefficient furnace. Paradoxical as it seems, a smoky chimney may be much more efficient than one which is smokeless. That is, a furnace operating with minimum air supply may cause clouds of smoke and still give a higher evaporation than one made smokeless by a large excess of air. There will, of course, be some loss due to carbon monoxide, unburned hydrocarbons, and combustible in soot, in the former case, but this may be more than offset

(Continued on page 310)

Next Steps in Forestry Program

Prepared by the Committee

FRANK L. MOORE, Chairman

D. A. CROCKER W. E. HASKELL R. S. KELLOGG C. H. WORCHESTER

Adopted at the Annual Meeting of the American Paper and Pulp Association on April 15, 1920, at New York

THE production of all kinds of paper in the United States in 1919 was nearly 6,200,000 tons, or 115 pounds per capita. In news print alone, one of the most essential of all commodities, the annual consumption has increased from 3 pounds per capita in 1880 to not less than 35 pounds in 1920. Increases in the use of other grades of paper have been equally striking and no one can set a limit to the possible extension of the field for paper products. It is most truly a Paper Age.

Principles Approved

But as has been repeatedly emphasized, the bulk of the raw material for paper now is wood and probably will continue to be wood so long as wood can be obtained. The report of this Committee submitted to you on November 14, 1919, which received your unanimous approval, attempted only to lay down the general principles which must be followed in any practical and adequate solution of the problem of a future timber supply so essential to this great industry. That report pointed out the proper share of responsibility to be borne by the timberland owners and by the public in maintaining our forest resources. We had 5,000 copies of the report printed and most of them have been distributed in response to widespread and continued demands for these suggestions for a National Forest Policy. Copies were sent to nearly all the English-speaking dailies of the United States by the Paper Committee of the American Newspaper Publishers Association. Favorable comments upon the plans proposed have been numerous in addition to the passage of resolutions of similar character by other prominent organizations. Many well-known foresters have commended the principles set forth, and while editorial approval has been given in many publications, space prevents the quotation of more than typical illustrations. For example, after reviewing in detail the report to the Society of American Foresters entitled "Forest Devastation," made by the Committee for the Application of Forestry of that organization, the American Lumberman says:

> "The Forest Policy as recommended by the American Paper and Pulp Association is a much more feasible plan than that proposed by this Committee and is one in which foresters, timber owners and the public ought to be able to cooperate."

A leading editorial in the World's Work reviews the whole situation and then says:

> "In the furtherance of welfare and prosperity the public is faced with problems which are as urgent in demanding attention as is that of conserving our national forests. But there are few in which the application of a solution will more surely produce the desired result. Thus, the outlook is optimistic in this distressing situaton of our shrinking timber supply. The solutions are at hand, governed by the laws of nature and formulated by forestry experts. It only remains to put these into intelligent operation in order to insure an abundant future supply of every sort of wood. The fundamental requirement is two-fold. First, it is necessary to protect the forests which we still have; and secondly, provision must be made for a future supply."

After stating the recommendations made by our Committee, the World's Work editorial concludes:

> "It is upon these or similar lines that the State and National governments should cooperate without delay, and leave no effort unspared to restore the balance between consumption and supply in this absolutely essential industry."

The most significant of all is a signed editorial by Dr. Fernow in the January Journal of Forestry (the official organ of the Society of American Foresters), which says:

> "The American Paper and Pulp Association at a business conference on November 14th accepted a report of its committee on Forest Conservation with suggestions for a national forest policy. It takes the position that there is 'no basis for any legal compulsion upon the private landowner to keep his land forested except in cases where after proper classification and indemnification it may be decided that the general welfare demands watershed protection,' but it admits that the private owner 'is under moral and legal obligation to handle his property in such a way that it does not become a public menace and the State may require him to conduct his cutting operations in such fash-

ion as to lessen the fire danger.' It declares that 'the production of large-sized timber is too long an under-taking with too great hazards and too low a rate of return to attract private capital in adequate amount.' It advocates a forest survey and land classification; public purchase of cutover lands by National and State Governments in cooperation, and also more vigorous extension of Federal Cooperation with the States in fire prevention; fair forest taxation laws; a very large program of forest planting, nurseries and working plans and other means of aiding reforesting operations, especially for smaller land holders; and a definite policy in operating State-owned lands. It is also admitted that some paper and pulp concerns might practice forestry on their own lands.

"With this attitude and program we can certainly not find any fault. It expresses all that we have contended for as practicable means for carrying out a national forest policy. What we need now are definitely drawn acts of legislation."

Proposed National Legislation

Your Committee thoroughly agrees that the time has now arrived for definitely drawn acts of legislation and we therefore recommend that authorization be given the Committee to proceed immediately in the formulation and introduction into Congress of a bill embodying an adequate National Forest Policy upon the general theory that in addition to the direct activities of the National Government a comprehensive forest policy requires cooperation of the states, since state forest reserves will contribute to National wealth and the products of such reserves will be used by states that are con-contributory. Hence aid in the state development of forest wealth available for inter-state consumption should be contributed by the National Government.

The National Forest Policy should therefore include:

1. A permanent annual Federal appropriation of $1,000,000 to be expended in cooperation with the States, for forest protection, care and management and the distribution of forest planting material. The annual expenditures from this fund in any state should not exceed the state appropriation for the same purpose and the benefits of the law should be limited to states which comply with certain definite standards to be fixed by the Secretary of Agriculture in cooperation with the state authorities as to the methods of forest protection and regeneration to be instituted in the various localities.

This is an item of expense and administration which while not directly chargeable to the investment account of our forest resources will greatly increase their value. This appropriation will not be sufficient after a short time and provision should be made for automatic increases up to a maximum of $5,000,000 as the states qualify under the provisions for co-operation.

2. An annual appropriation of $500,000 to continue so long as necessary to enable the Federal Government to make a complete and accurate forest survey and classification of all lands now included within the boundaries of the National forests and to cooperate with the states and private owners upon a mutually contributory basis in the making of similar surveys and classifications of public and privately owned lands, to the end that accurate knowledge may be obtained as to kinds, character and quantity of existing timber stands, the areas which are better fitted to forest production than other purposes, and that such surveys and classifications may serve as the basis for an adequate permanent forest policy, National, State and individual.

This is an item of proper expense which provides the necessary knowledge and basis upon which to make subsequent federal and state investigations of lands suitable for timber growing. The work which has already been done in classifying the National Forests is a good start toward a forest survey and land classification for the entire country.

3. A permanent annual Federal appropriation of not less than $3,000,000 to be expended in the completion of the program contemplated in the acquirement of forest areas upon the water sheds of navigable streams in New England and the Southern Appalachians and the extension of purchases of land suitable only for timber growing to all parts of the country where areas best adapted to Federal management can be obtained.

This is a direct investment account whose ultimate value to the Nation will be far in excess of the amount expended.

4. The extension of general authority to the Secretary of Agriculture to exchange National forest land, stumpage or timber certificates for private timbered or cutover land within or adjacent to existing National Forests, it being the recognized permanent policy to continue the extension of National Forests through exchanges as herein provided or direct purchase of suitable areas as provided in paragraph 3 until the area of National Forests shall be at least 200,000,000 acres.

This item, while not requiring any great expense, since the work involved will be done by the regular force of the Forest Service, will eventually add much to the value of the National Forests through a blocking up of holdings which will permit far more effective administration and operation.

5. A permanent annual appropriation of at least $1,000,000 for forest planting operations in the National Forests upon lands adapted to timber growing

which will not become productive through natural agencies.

This entire appropriation is a direct item of investment which eventually should yield good returns to the Nation.

6. A permanent annual appropriation of $500,000 for direct and aid to forest research and investigation.

Proper and effective use of all forest products and resources is impossible without continuous research and investigation. The expenditures proposed will yield in the aggregate a much greater return than the expense involved, since the information secured and methods of utilization devised will be of permanent value to the forest using industries and to the public.

7. The extension of the Federal Farm Loan Act to include loans for a maximum period of fifty years for the purchase or improvement of forest lands cut over or bearing immature growth, for holding or protecting such lands previously acquired, for reforesting land or the employment of any other measures designed to promote timber growth. Such loans to carry a specific obligation by the owner to retain the land in growing timber and to protect and care for it during the life of the loan according to definite standards of silvicultural management.

* * * *

These recommendations cannot be criticised on the basis of the expense involved. They are exceedingly moderate in view of the magnitude of the problem to be solved, and represent true economy in the treatment of a basic national resource.

To recapitulate, the initial yearly expenditure proposed in the foregoing items may be classified as follows:

For forest investment	$4,000,000
For care of forest resources	1,500,000
For research and investigation of forest resources	500,000
Total	$6,000,000

The present annual appropriation for all the work of the United States Forest Service, including the protection and administration of 135,000,000 acres of National Forests, is only $6,000,000 and over two-thirds of this amount is returned to the public in receipts from the sale of timber, grazing fees and other privileges. A conservative capitalization of the present values of the resources of the National Forests totals $1,250,000,000.

Adding to the present Forest Service appropriation all the items above suggested would make the total annual National expenditure upon our timber supply less than one-half the cost of one modern fully equipped battleship and only one per cent. of the capitalized value of the forest resources which are Nationally owned. Surely no adequate proposal could be more modest!

That the practice of forestry is the only solution of the problem of developing non-agricultural lands has been accepted as a principle by the Federal Government which is actually practising forestry over considerable areas of the National Forests. This principle, which is basic in any economic discussion of the use of land, has not been accepted generally by the States, and little has been done to develop "Forest Land" so that it may contribute to state support.

Appropriations which in some states run into the millions of dollars are made annually for the development of agriculture. If it is fundamental that the agricultural lands shall share in the support of the state and therefore be aided by the state in development, it is equally fundamental that the forest land shall bear its share of the support of the state and that the state should develop all lands suitable for forest growth.

That the States of the Union may put into effect the principle that all land must be made as productive as its character will allow and that all land must share alike in the support of government, your committee recommends authorization to proceed in the formulation and introduction into state legislatures of bills which shall embody policies harmonizing with those suggested for the Federal Government but applicable to the special needs of the several states. Such bills should state clearly:

1. That it is a fundamental principle in state economy that the soil which is a basic wealth producer shall be made reasonably productive, either through the application of agriculture or forestry.

2. That while both agriculture and forestry deal with crops from the soil there should be a clear distinction based upon the fact that methods used in the production and utilization of the forest crop are fundamentally different from those applicable to farm crops. That the administration of the natural resources of the states should be under a conservation commission subdivided into departments of forests, waters, fish and game, and that the men appointed by the commission to head these departments should be especially qualified by education and experience to carry on the work of those departments in the most efficient manner, and to cooperate with the Federal Government in accordance with the plan proposed in the preceding section of this report.

3. That appropriations should be made and means given for a thorough survey of the state, that it may be known just what is forest land and what is agricultural land. Such surveys should be carried out in cooperation with, or through aid given by the Federal Government.

4. That the lands of the state should be so classified for the application of forestry that the forests necessary for protection of water supply or of slopes of hills and mountains of such character that it is unsafe to remove the forest cover, shall be acquired and set aside as parks, such forest parks to be dedi-

(*Continued on page 308*)

Fire Drills

Prepared by the Engineering Department of the National Safety Council

THE purpose of a fire drill is to get the occupants out of the building without confusion, and to train employes to leave promptly when the alarm rings, without stopping to get clothing or other valuables. A fire drill is of no value unless it is carried out seriously and under rigid discipline. One of the worst of American factory fires occurred in a building which had been equipped with a fire alarm system in accordance with the State law, but where the employes took the alarm of fire as a joke and did not try to leave the building until it was too late.

Fire drills are also a valuable check on the adequacy and good condition of the exits and alarm system. Without these, a successful fire drill cannot be carried out.

The following suggestions for the organization and execution of exit drills have been promulgated by the National Fire Association:

Organization and Duties

All factory exit drills should be subject to the direction of a supervisory organization constituted as follows: chief engineer of exit drill; floor chiefs; room captains; stairway guards; searchers, and inspectors.

Chief Engineer of Exit Drill should be someone whose position would command respect and insure compliance with all orders and instructions relating to the drills.

Duties of Chief Engineer of Exit Drill. He will have general charge of all matters pertaining to exit drills, practice maneuvers and organization, and will designate all persons to fill the positions above mentioned. He will fix the time for making drills and rigidly enforce measures of discipline for failure on the part of any employe to observe fully all the rules and requirements; by personal inspection, he should see that over-crowding in work rooms, or elsewhere, is prevented, and that sufficient space is given to aisles and passageways to permit quick access to all of the exits.

Floor Chiefs. Care should be exercised in the selection of these men or women, as upon them largely depends the efficiency and success of the drills. Where department foremen (or women) or factory superintendents possess the requisite qualifications, their selection is to be preferred. It is important, however, that they have the trust and confidence of their employes generally, with a fair degree of self-possession and capability of speaking the language of the operatives.

Duties of the Floor Chiefs. The floor chief shall have immediate charge of all employes or operatives employed on his floor in all matters pertaining to exit drills. He shall be held responsible for the enforcement of all rules, and will report to the chief engineer any employe who wilfully neglects their proper observance.

He shall see that each movement corresponding to the alarm signal is promptly and properly executed, and shall personally supervise the sounding of the general building alarm on his floor. He shall be furthere responsible for the condition of all aisles and passageways, and will see that chairs, benches, and stock are promptly removed to insure unobstructed passageways.

When, by prearrangement in drill practice or as a result of actual fire, it may be necessary to depart from the regular instructions as regards selection and use of exits, such change will be at the sole direction of the floor chief.

Room Captains. Whenever floors are subdivided into two or more rooms, the floor chief will be assisted by the room captains. For floors of large area, the floor captains should designate a supervisor for every fifty employes, to assist in maintaining the necessary control and discipline. For these latter positions, it may frequently be desirable to make selections from the forewomen.

Room captains should be chosen from those highest in authority, preferably a foreman or work boss. The same general care in their selection should be exercised as indicated for the floor chiefs.

Duties of Room Captains. They should perform the same general duties in their respective rooms as are prescribed for the floor chief, subject to the latter's direction and supervision, excepting that they shall have no authority to change the assignment of exits, nor sound the general building alarm unless under direction of the floor chief.

Stairway Guards. For these positions, men are to be preferred; they should be strong and alert, capable of acting quickly in emergencies. Two men selected from each floor should be assigned to each exit or stairway.

Duties of Guards. Guards are to be subject to the orders of the floor chief or room captains, and shall see that the march from the rooms and in descending the stairway is orderly and without crowding and at uniform speed, with careful observance of spacing between files. They shall be especially watchful to prevent trampling of persons stumbling or falling, and no conditions should be allowed which require a halt after the exit march has started.

Guards shall be stationed as follows: One guard on the room side of the door leading from the room,

who shall see that the door is opened promptly after the first signal and is kept open until all the occupants have left the room and then that it be closed; and one guard on landing midway on staircase descending to the next floor below. Where stair exits have sharp bends or are poorly lighted, additional guards should be provided as required. All the foregoing officers should have a first and second assistant to help in general work and to take charge, by seniority, in case of the absence of the officer.

Searchers. There should be at least one man and one woman searcher on each floor with alternates. They should be cool headed and strong.

Duties of Searchers. Searchers should immediately after the signal visit the toilet rooms and any rooms in which there may be occupants who cannot hear the signal. They must look out for any people who may become hysterical and faint.

Inspectors. An inspector selected from among the employes should be appointed to examine each morning the condition of all stairways, fire escapes and roof exits, if any, and to report immediately to the chief of exit drill any obstruction found thereon or any other unusual condition. In large establishments where many are employed, the inspector should be uniformed, preferably with fire department experience. He should make regular rounds of the building and register on an approved watchman's clock.

He shall also see that all doors leading to stairways or exits open outwardly in such a way as not to obstruct the passageway, and will immediately report any found locked or obstructed to the floor chief or chief engineer.

During the winter season, attention should be given to any existing fire escapes where exposed to accumulations of ice or snow, and, whenever so found, immediate steps should be taken for its prompt removal.

In addition to the above, provision should be made for a daily inspection and test each morning of the alarm system and of all signaling devices; report thereof to be made to the chief engineer.

Drill Exercise

Exit drills should be held as often as necessary, depending upon the design of the building, the character of the industry, intelligence of employes, etc., and should include everyone in the building.

It is advisable that the alarms announcing the drills for each trial should originate on different floors, in order to give different people an opportunity to learn how to act and have the signal sent when they discover a fire, and to afford practice in changing the order of procedure for possession of stairways or fire escapes, if the design of the building requires the latter to be used; excepting that the line of march may be so arranged as to take advantage of the additional time required in the descent of those from the upper floors, by dismissing such of the lower floors as would not delay the egress of the former.

A further exception to the rule should be made where buildings are divided by fire walls having protected openings, which would allow the transfer of all the occupants on a given floor in the fire section to an adjoining section on the same floor in the building, or by means of doors or a balcony to adjoining buildings, or where provision is made for ascending to roof exits that may lead to safe retreat, either on or in an adjoining building.

In assigning stations, the first consideration is to man the aisles leading to each exit from the fire district, and to prevent pushing and overcrowding. As far as possible, the aisle guards will endeavor to effect line formation, in order that the approach to the exit may be as orderly as possible. At all times, special consideration should be given to women and children.

Employes who are not members of the section in which they may find themselves at the time of the test, upon the first signal should be at attention and assemble for the line formation.

Drill practice for tests should closely approximate military precision. It should be orderly and without confusion, and the movements should be simple and as few in number as possible. All movements should lead in the direction of the exits and follow in response to gong strokes.

The first alarm with consist of a series of strokes on a single tap gong (twice repeated), indicating the floor from which the alarm is given. Upon the first stroke of this alarm, all employes will immediately cease work, rise, and as far as possible shut off power machines.

Upon the first stroke of the drill gong, each operative will remove the stock, chairs or benches nearest him in the aisles, placing same either under or on top of the work table or machine. Before the sounding of the second stroke, all aisles and passageways should be cleared of obstructions, and the operatives should stand ready for line formation, which should be announced by the second stroke.

The next movement should be to march to the door of exit passage in single or double file. If in double file, couples should link arms for mutual support, the women using a free hand to raise their skirts to prevent tripping themselves or those in their immediate rear, especially on the stairs, and each file will move forward, observing a uniform distance between couples to prevent touching. The line should start on motion signal of either the floor chief or room captain, and continue on to the stairway and descend, being subject only to the signals of the stairway guards.

No employe or other persons should be permitted to attempt to secure clothing or street apparel from the locker or cloak room.

Drill exercises should aim to bring into practice as

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Address Before the Illinois Constitutional Convention, April 14, 1920

By CHARLES PIEZ
President of the Link-Belt Company, Chicago

MR. CHAIRMAN, Gentlemen of the Committee: I have been requested by the Illinois Manufacturers' Association to present reasons why the suggestions of organized labor covered by Proposal No. 232, given below, should not be incorporated in the Constitution:

"STATE OF ILLINOIS
CONSTITUTIONAL CONVENTION
No. 232
"A PROPOSAL

"To insert a separate article to be designated 'Labor.'

"Resolved, That the following shall become a part of the Constitution of Illinois:

LABOR.

"Section 1. The labor of a human being is an attribute of life and is not property.

"Section 2. The right of workmen to organize into trade and labor unions and to deal and speak through representatives chosen by themselves is declared and it shall not be abridged.

"Section 3. No court, tribunal, judge nor any officer or official shall by any process, order, injunction, restraining order, decree or proclamation abridge the right of any workman to quit any employment either singly or in concert, nor the right of by peaceful persuasion, picketing, assemblage or the payment of strike benefits inducing others so to quit or to refrain from working, nor shall any such acts be made or held to be unlawful, or to constitute an unlawful conspiracy. Nor shall any such process, order, injunction, restraining order, decree or proclamation interfere with the exercise of the legitimate functions of any organization formed for the purpose of advancing the interests of those who labor."

Being a layman, I shall confine myself to a discussion from the economic and industrial standpoint.

Even to a layman, however, it seems that the Constitution should confine itself to a declaration of principles, and to guarantees to each and every citizen, of equal rights, protection and participation in the government. The singling out of any group or class for special treatment, for a separate definition of rights or grant of privileges, seems to me to be subversive of the entire idea of such a government as ours.

It is impossible to tell what the future will hold in industrial and social problems, nor to what extremes the parties to the controversy may resort. It may, in the solution of these problems, be necessary for the state to invoke the very remedies which the proposal submitted by labor seeks by constitutional provisions to inhibit, and it would certainly be unwise in this Convention to estop future legislatures from enacting legislation that but a few months ago actually prevailed in the United States Senate, and received a large vote in the House of Representatives.

Mr. Kerr in his presentation refers to the many wrongs which labor has suffered, and asks for the adoption of Proposal No. 232 so that labor may be secure against their recurrence. It is a habit of these gentlemen, in order to enlist public sympathy, to refer to ancient, and even legendary, wrongs as if they still existed, and on that account I present a statement of a few facts and conditions that may be helpful to a proper perspective. There is not in the existing Constitution any declaration like Section 1, that the "labor of a human being is an attribute of life and is not property," yet Illinois has in the past twelve years enacted legislation that has recognized the right of the worker to safe, wholesome surroundings, to the compensation in case of industrial accidents, and has prevented the exploitation of children in industry.

In the recognition of human rights in industry, Illinois stands a leader among the large industrial states, and permit me to add that in developing the State Factory Act, the Workmen's Compensation Act, the Mining Act, and the Occupational Diseases Act, representatives of labor and representatives of employers collaborated, not only in drafting these measures, but in winning public support for them. In all these matters, remedies were developed when public opinion recognized the need for them.

So complete has been the work of the state, that, beyond a few insignificant amendments to existing Acts, there exist substantially no demands for any basic remedial industrial legislation at this time.

Sections 2 and 3 of Proposal No. 232 ask for incorporation in the basic law of the state, of principles which will absolutely turn over to organized labor, without exaction of any responsibility, the control of the industries of the state.

Section 2 declares that the right of workmen "to organize into trade and labor unions, and to deal or speak through representatives chosen by themselves, shall not be abridged." This is a request for an ex-

ceeding broad exercise of power, couched in most innocent and ingenuous language.

There seems to be no reason for incorporation of the first part of this Section, for the right of workmen to associate in a lawful manner for lawful purposes is generally acknowledged, and has certainly not, within my memory, been questioned in Illinois. The joker in this particular section exists in the last phrase, "and the right to deal or speak through representatives chosen by themselves, shall not be abridged," for you might as well provide, so far as practical results are concerned, that hereafter no individual worker and his employer shall have the right to enter into contractual relations with each other, as to incorporate Section 2 in the Constitution.

Mr. Kerr has asked for his provision because of the assumed difference in bargaining power between the employer and employe. At first sight there is apparent foundation for this claim, yet the difference in bargaining power between employer and employe is exactly the same as that between buyer and seller in any commercial transaction. Just now there are one hundred jobs for every eighty men, and the constant and immoderate increases in wages indicate that the workman has an overwhelming advantage in bargaining power. This advantage changes from employer to employe, just as it shifts from buyer to seller, whenever demand largely exceeds the supply. This is and has been for many months a seller's market, and it has marked up both prices and wages. A long continued buyer's market will bring about an adjustment on a descending scale. It is extremely doubtful, however, because of the tremendous destruction of man-power through the war, whether there will not continue to exist for a long time a labor market in which the workman has a distinct advantage in bargaining power.

I should like to ask Mr. Kerr whether since the passage of the Adamson Act there has been anything like equality of bargaining power between the railroads and their men. Restricted by Federal and State control of rates, and by the demand for continued service, the railroads are prevented from aggressive resistance to wage advances on one hand, and from recouping by an advance of rates on the other. There does not seem to be in the present situation anything to substantiate Mr. Kerr's claim for what is, in its inevitable effect, compulsory collective bargaining.

I believe both Mr. Kerr and his associates are fully conscious of the enormous power which such collective bargaining, provided for in this Section, will place into the hands of organized labor. The provision carries with it no restrictions of any kind, prescribes no fair method for determining the choice of the representative, and calls for no collective responsibility to observe the agreements arrived at by collective bargaining.

It does, however, open up the opportunity to every agitator, to every professional trouble-maker, by false promises, by lies and treachery, to organize a raid against any industry whose profits hold out the hope of rich booty. And it denies to every workman or employer who wishes to retain his freedom of action, the right to work or conduct his business.

It was on the question of collective bargaining, through chosen representatives, that the first Industrial Conference called by the President last Fall split. And it was owing to the fact that the War Policy of the Administration prescribed collective bargaining through chosen representatives, as one of the basic principles in the employment relationship, that membership in the unions grew apace, and the open shop on government or war work ceased to exist.

I am not going to weary you with a recital of the many breaches of agreements, solemnly entered into by chosen representatives after collective bargaining, during the past eighteen months. It will be admitted that unless labor assumes some enforcible responsibility for carrying out its agreements, the time may come when the public interest will question the wisdom of permitting labor to use concerted action. But this is a legislative question, and not a constitutional one.

And it is well to remember that no solution has as yet been found for the conditions as they exist today, and that at present public sentiment is slowly crystallizing in favor of greater control, greater restrictions, the imposition of greater accountability; not the grant of greater power.

It is easily conceivable, in the case of railroads and the basic industries like coal-mining, that men engaged therein shall, as a part of their contract of hiring, be compelled to waive the right to strike and accept the decisions of a properly constituted, impartial tribunal. To claim that such legislation condemns the men to involuntary servitude is arrant nonsense, for in those cases the question is no longer an issue between employer and employe, but between the public and one of its members, and involves no more than the submission of the workers to the fairness and decision of the majority, a discipline that all citizens in any democracy must accept. The right of the worker to strike, can certainly not be declared superior to the right of the public to live.

It may also be necessary at no distant date to declare it a misdemeanor for policemen and firemen to strike, or even to affiliate with a union or organization not composed exclusively of policemen or firemen in the same employment.

Men intrusted by the state with the protection of life and property, cannot be permitted to strike and leave the community open to attack from the lawless and the criminal. Here, too, the community has a right to demand the submission of the interest of the individual to the public interest. And it goes without saying, that affiliation of the guardians of the peace and public safety, should not be permitted with or-

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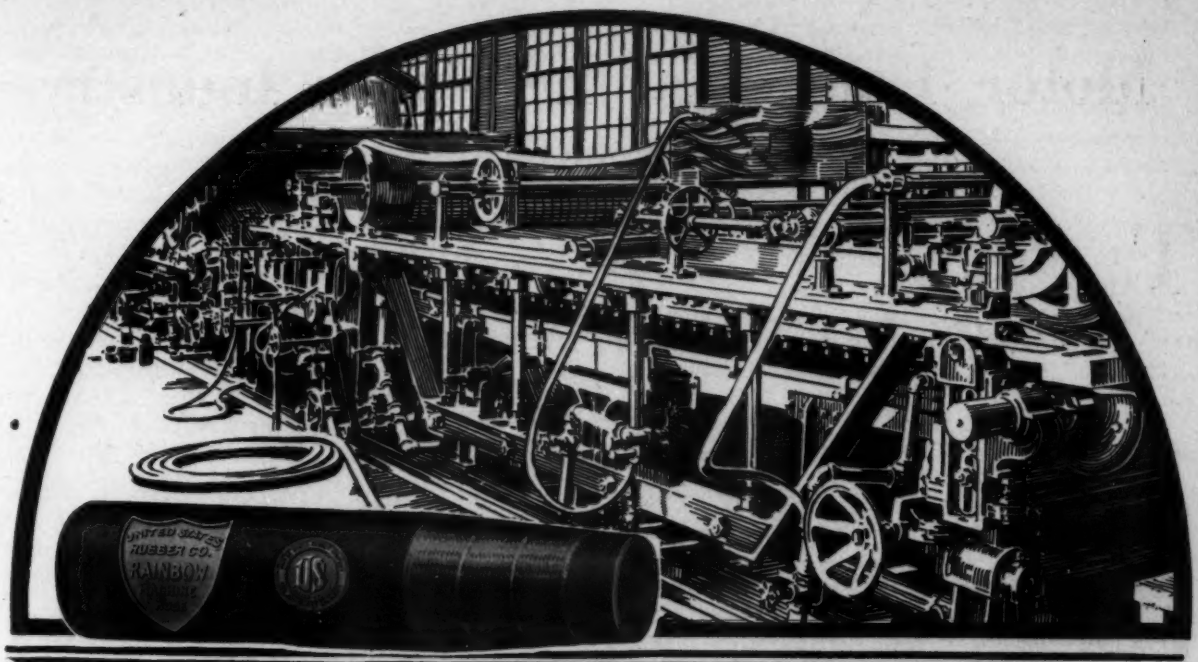

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Motor Trucks in the Paper Industry

By J. W. SPAULDING
The White Company

TRANSPORTATION service rendered by motor trucks in the paper industry begins in the forest, where the timber for wood pulp is cut, and goes on through the many phases of manufacture and distribution until at last a motor truck delivers the finished product into the hands of the consumer.

The uses of motor trucks in the paper business are diversified, and their advantages are many.

Through the economy of their operation, their dependability in service, their adaptability to a multitude of applications under varying conditions and their downright, all-around usefulness, high-grade motor trucks have become as important and as well-recognized a factor in the industry as has any other kind of time-and-labor-saving machinery that the paper man deems necessary to his business.

Motor trucks haul thousands of tons of material for building highways from railroad sidings and from the paper mills into the great forests where the pulp timber is cut. They carry logs over these completed roads. They transport vast quantities of materials used in the constructing and equipping of logging camps. They have their transportation part in the building of giant dams and reservoirs. They carry food, clothing, tools, supplies of all kinds to thousands of workers in the remote camps. They do the hauling work about the mills, themselves, carrying fuel, supplies, ashes; and they carry the finished product to the shipping points. They fetch and carry for an industry having so vast a field of activity and so wide a range of operation that it is possible here to present only a cross-section. And this cross-section seems best to take the form of a description of the part motor truck transportation has in the business of one of the leaders of the paper industry—the Great Northern Paper Company.

A Transportation Problem

In the West Penobscot Valley, in Maine, are the mills of the Great Northern, at Millinocket, East Millinocket and Madison. Up the streams and gorges to the west and north are the forests of spruce that are the standing, raw material for the mills. The company owns and operates a fleet of 16 motor trucks.

Although the Great Northern company controls timber-cutting right over a great part of the state, its cutting operations are confined to a strip 50 miles wide, extending from a point near the center of the state northward to the Canadian border and approximating in area 3,500 square miles.

Two problems faced the company in 1913: To regulate the flow of water in the Penobscot, leading to the mills; and to make accessible new stands of timber, for select trees along the main streams had been cut out during the years that Maine had furnished the bulk of wood pulp for the paper making of the country.

To overcome seasonal low water, which decreased mill operation, engineers of the company planned a dam to impound the waters of Chesuncook, Caribou and Ripogenous Lakes—a dam that was to be 1,000 feet long, 80 feet high and stout enough to hold a reservoir 25 miles long, with a capacity of 21,500,000,000 cubic feet of water.

The only logical site for the dam was in the rocky gorge at the outlet of Ripogenous Lake; but this was 50 miles from the nearest railway or highway. The most practical route to it was to ferry from Kineo, the nearest rail-head, across Moosehead Lake to Lily Bay, a small village, and then to follow an old "tote road" for 38½ miles over the hills.

A railroad, the engineers decided, was impractical; for, with the dam completed, the line would be left unproductive. Teaming, they estimated, would make necessary a $250,000 private road and equipment that would cost almost as much more. They figured that a four-horse team—which would cost $2,000 in the initial outlay—hauling 3½ tons a trip, could make two round trips weekly over the road to the dam, and thus transport seven tons. Motor trucks that could stand up under the strain, they figured, could make two round trips daily with 5-ton loads, and thus carry 70 tons a week, or ten times the work of a four-horse team. And, with the reserve horses needed to carry on the team method, they found that

(*Continued on page* 312)

Silicate of Soda

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Packing Cases for Export

By J. B. FREAR
Engineer in Forest Products

FROM all sources we are hearing the same story: "American shippers do not know how to pack goods properly for foreign shipment." A copy of a letter received recently at the Forest Products Laboratory, Madison, Wis., stated in no uncertain language that if American goods could not be packed so as to be delivered in good shape at a certain town of western Africa, European markets would have to be resorted to.

Trade Opportunity and Packing Demands

The paper manufacturers of America have now the opportunity to build up considerable export business, but it is absolutely necessary that the containers in which their products are shipped shall be in every way adequate for the purpose.

Do you believe it wise to leave the details of working out a proper export container to a shipping clerk who has no idea of the requirements to be met? Either see that he is supplied with necessary information on the requirements of export containers, or else get a man on the job who has sufficient knowledge to handle the proposition.

Prices Influenced by Packing

It would be well not to quote prices until you know what it will cost to pack your goods properly. No matter how low your price is, if your goods do not arrive at the foreigner's door in usable condition, he will not buy from you, and the result is that you have lost money, goods and customer.

Some Suggestions

No one knows all about packing for foreign shipment; but there are some individuals, firms, etc., who have considerable knowledge relative to the subject. It will certainly not be admitted by any loyal American that we are incapable of learning rapidly how to pack as effectively as our foreign competitors. It means, however, that we must get at the business at once.

It has been stated by one exporter of paper that about 500 pounds is the usual size of export packages for sheet paper of various sizes. It has been demonstrated by tests at the Forest Products Laboratory that for boxes which carry as much as 500 pounds of paper the lumber should contain from 12 to 18 per cent of moisture, based on the oven dry weight, and that it should be free from decay, dote, knot holes, and loose and rotten knots larger than one inch in diameter, all knots which extend more than

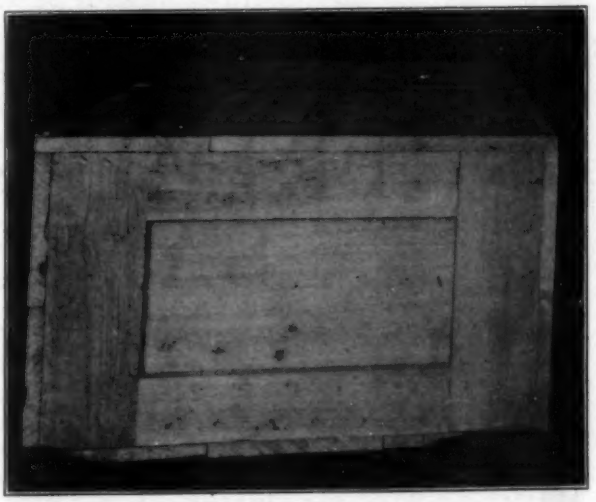

Figure 1

one-third across a board, and all knots which interfere with the proper nailing of the pieces. Lumber which is seriously cross-grained should be eliminated for cleat construction. No piece less than five inches in width should be used except in cleats.

The box ends should be made of some wood which has the property of holding nails very securely. The curve (Fig. 2) shows graphically the variation of different species of wood as to density and nail-holding power. The woods of Group IV of the list at the end of this article are suitable for this purpose. The lumber should not be less than three-sixteenths of an inch thick. The preferred style of end is shown in Fig. 1, the cleats of which should be made of lumber from the same group and thickness as the ends and at least three and one-half inches wide. The cleats should be securely nailed to the ends, nails spaced

When you need fuses remember that

ECONOMY

renewable

FUSES

—were the first line using an inexpensive bare link for restoring a blown fuse to its original efficiency to be APPROVED IN ALL CAPACITIES—0 to 600 amperes in both 250 and 600 volts—by the Underwriters' Laboratories.

—bear the "Und. Lab. Inspected" label. Economy "Drop-Out" Renewal Links are stamped with the "Inspected" symbol.

—long ago won public approval—evidenced by the fact that for many years millions of them have been giving dependable protection, high efficiency and working marked economies.

—cut annual operating costs 80 per cent as compared with the use of one-time fuses.

—are used wherever efficiency and economy are chief considerations—in steel mills, manufacturing plants of all kinds, buildings, and in every branch of industry.

—are used wherever safety is the prime consideration—in powder mills, hospitals, schools and the United States Navy.

—are absolutely accurately rated, made of the best materials and by the most skilled and careful workmen obtainable.

—are sold by all leading electrical jobbers and dealers.

Insist on getting Economy renewable Fuses

Economy Fuse & Manufacturing Co.
Chicago, U. S. A.

Economy Fuses also are made in Canada at Montreal

WAUSAU SULPHATE FIBRE CO.
TRADE MARK
MOSINEE, WISCONSIN
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Cut down *excessive* wrapping paper investment. Why carry two wrapping paper lines for one wrapping paper *purpose?*

MOSINEE

presents a perfect wrapping paper, weight and strength for each wrapping purpose. Made in all weights from 15 pounds to 100 pounds basis. The one complete, standardized and economical line of wrapping paper sold.

Mosinee Kraft

"The Wrapper that Delivers the Goods"

not over one and three-quarters inches apart and staggered in two rows, with the end nails about one inch from the ends of the cleats. The nails must be driven straight thru and of sufficient length to clinch securely.

The sides, top, and bottom may be made of wood from any group, but should be three-sixteenths of an inch thick when of Groups I and II, and may be one-eighth inch thinner when of Groups III and IV. When the sides, top and bottom are of Groups I and II it is preferable to nail them to the ends and cleats

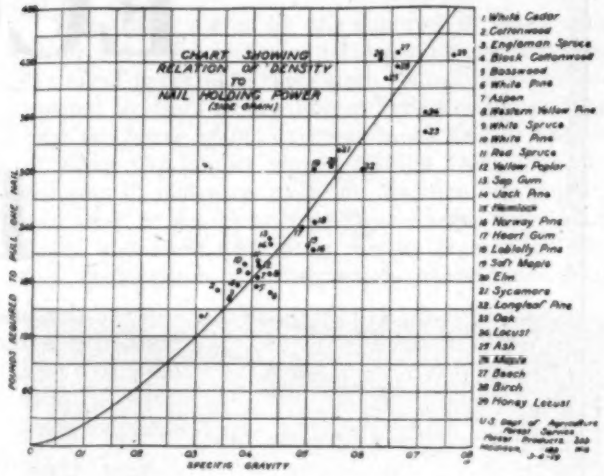


Figure 2

with 8d cement-coated box nails, spaced about one and one-half inches apart and alternated between cleats and end. The outside nails of sides should be driven in the cleats and the outside nails of top and bottom driven into the end. When the sides, top and bottom are made of Groups III and IV woods, 7d cement-coated box nails are desirable and should be spaced one-fourth of an inch nearer than for 8d nails.

These boxes should be securely bound with not less than three box straps at least three-quarters of an inch in width and .020 inches in thickness, made of cold rolled unannealed steel.

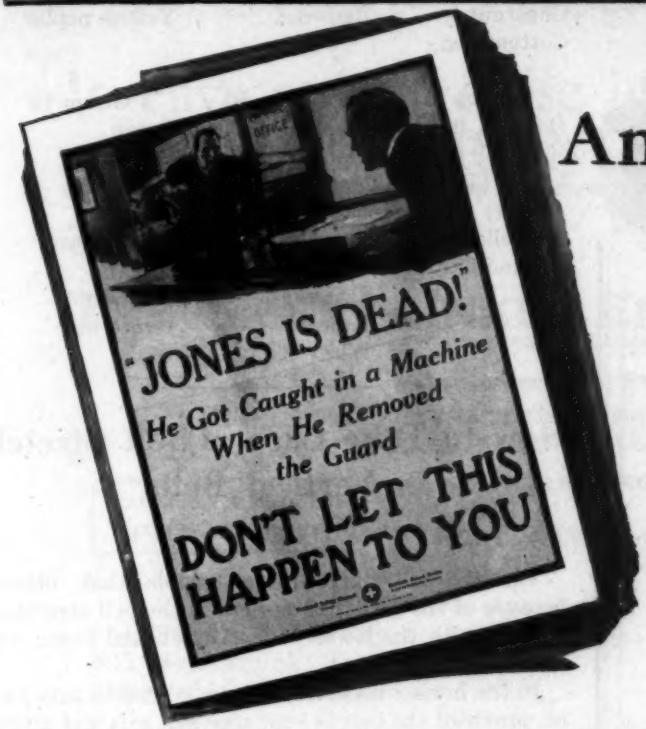
A moisture resisting lining should be placed in export boxes for paper. This lining can be made up in various ways by combining kraft paper and asphaltum.

Box Woods

The following woods are commonly used in box construction and the grouping is based on their nail-holding power and resistance to splitting.

Group I

Alpine fir	Cucumber	Spruce
Aspen	Cypress	Sugar pine
Balsam fir	Jack pine	Western yellow pine
Basswood	Lodgepole pine	White fir
Buckeye	Magnolia	White pine
Butternut	Noble fir	



And Jones Is Only One of Thousands Killed Each Year in Accidents

Saving Jones and all of the thousands—saving you the dollars which each accident costs—is the mission of the National Safety Council.

What the National Safety Council Is

Thirty-eight hundred industrial concerns co-operating to prevent accidents.

What It Does

It helps you to prevent accidents. It saves money for you. It offers the only service in existence that is comprehensive enough to meet present day conditions and produce results.

It offers—to you, individually, and to Industry, as a whole—the opportunity to reduce all accidents 75%. It is strictly non-commercial and non-profit-making.

Write the Business Division for Details

National Safety Council

Co-operative *Non-commercial*

168 N. Michigan Avenue, Chicago

Wheeler Motor-Driven Centrifugal Pump

WHEELER centrifugal pumps are built for all services in pulp and paper mills.

Any drive can be used—motor, turbine, belt, or rope.

Built in all capacities for pumping against any commercial head.

Wheeler pumps are designed to meet the local conditions of the installation and the speed requirements of the motor, turbine, etc.

Pumps are of the split casing type with suction and discharge valves in the lower half of the casing. Bearing brackets are not cast integral with the casing, but bolted thereto. Impellers are of government bronze of the enclosed double suction type, manufactured by improved methods which prevent distortion and result in a finished impeller which is true to pattern in all details.

Write for our centrifugal pump bulletin No. 108-B, which fully illustrates Wheeler pumps of various sizes and types with horizontal and vertical shafts.

Wheeler Condenser & Engineering Company
Carteret, N. J.

Branch Offices:
New York, Boston, Philadelphia, Pittsburgh, San Francisco, Los Angeles, Salt Lake City, Denver, Seattle, Chicago, Cincinnati, Atlanta, New Orleans

No. 79

Cedar	Norway pine	Willow
Chestnut	Redwood	Yellow poplar
Cottonwood		

Group II	Group III	Group IV
Douglas fir	Black ash	Beech
Hemlock	Black gum	Birch
Larch (Tamarack)	Maple, soft or silver	Hackberry
So. yellow pine	Pumpkin Ash	Hickory
Va. and Car. pine	Red Gum	Maple, hard
	Sycamore	Oak
	Tupelo	Rock elm
	White Elm	White ash

How to Take Care of Belt Stretch in Vertical Belts

By W. F. SCHAPHORST, M. E.

Vertical belts give more trouble than others, because of the fact that as soon as the belt stretches, contact with the lower pulley is lost, and power will not be transmitted.

In the horizontal drive, stretch is easy to take care of, provided the belt is kept nice and soft and pliable with a treatment that penetrates, surrounds and lubricates every tiny fibre. It then becomes unnecessary to take up horizontal drive at all. Many drives are in daily use which have not been taken up for eighteen years or more, and then they were taken up only because the belt became so slack that the slack side touched the tight side. Extreme slackness is as impractical as extreme tightness.

Where vertical drives are used, it is obviously impractical to permit slack running, because it is necessary to continually take up the belt stretch as the stretch occurs. One successful and economical method that has been brought to the writer's attention to constantly keep vertical drives in pulling condition, is to have a number of "fillers" or "inserts" in stock, already punched to match the belt and ready for insertion and lacing. Thus, for example, when a belt is put on new, it is cut short by an amount depending upon the distance between the shaft centers. The belt man uses his judgment as to what this short cut should be. Let us say that he desires to make it seven inches. He then selects a filler 7 inches long, of the same width as the new belt, and laces it into place, either with rawhide or wire lacing.

In a short time the belt will stretch and will need taking up. The belt man then simply removes the seven-inch filler, and replaces it with a six-inch filler. After another week, say, he replaces the six-inch filler with a five-inch filler, and so on until all of the stretch, or most of it, is taken out of the belt.

The fillers can be kept in stock and used repeatedly. In this way there is no loss of belting material due to

It Pays to Advertise in The PAPER INDUSTRY

THE GRILEY-UNKLE ENGINEERING CO.

OF MONROE, MICHIGAN

MANUFACTURERS AND PATENTEES

UNKLE PULP EXTRACTORS, UNKLE RAG CATCHERS,
UNKLE BEATER ROLL RAISERS

PLEASE REPLY TO THIS LETTER TO FORT WAYNE OFFICE

SALES OFFICE, 210 CENTRAL BUILDING

FORT WAYNE, IND.

March 12, 1920

The Paper Industry,
501 Monadnock Block,
Chicago, Illinois.

Gentlemen:

No doubt you are always pleased to hear something good about your paper and I want to say to you that The Griley-Unkle Engineering Company have found it to be a most valuable advertising medium.

The writer hesitated a little about carrying space in your publication, but we are very pleased to say it has proven all that you said it would and a thousand times more.

Wishing you success, we are

Yours very truly,

THE GRILEY-UNKLE ENGINEERING CO.,

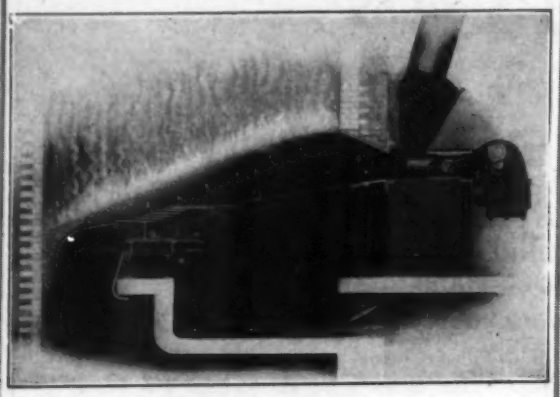
H. J. Andrews

HJA/M

Vice President.

A Good Device Advertised in a Good Magazine Brings Wonderful Results

Let Riley Stokers reduce your costs



Cross section through stoker showing automatic operation.

Riley Stokers are always on the job—you can rely on them to be at work every day. They are tireless—working all hours of the day and night—without complaint.

Paper Mills can cut their operating costs to a minimum by using Riley Underfeed Stokers. Consider the following facts:

RILEY UNDERFEED STOKERS

EFFICIENCY—Boiler tests on Riley Stokers have shown over-all efficiencies of 80% and higher.

LABOR SAVING—One or two men can replace ten or twelve required for hand firing. Continuous, automatic discharge of ashes means elimination of drudgery in fire cleaning. Labor for ash handling in a well laid out plant is negligible.

CAPACITY—Capacities of 200% and more can be obtained over long periods which means fewer boilers with corresponding decrease in investment and maintenance.

COMPLETE COMBUSTION—The underfeed method and moving grates intimately mix the proper amount of air and coal, giving perfect combustion.

Catalog D-4 sent on request.

Sanford Riley Stoker Co.

WORCESTER, MASS.

British Licensees: Erith's Engineering Co., Ltd., London. French Licensees: Erith, Leroy & Cie., Paris, France.

taking up, nor is any time lost due to the punching of new holes, as they are already punched in the fillers.

The writer does not recommend this filler method for horizontal or sloping drive, because he is a believer in the slack drive, which gives maximum arc of contact between belt and pulley, least bearing friction, and highest efficiency.

Stairways to Crane Platforms

In many plants overhead crane operators have no convenient means of reaching their crane cages. Oftimes a ladder at one end of the crane runway provides the only means of access to the cage. Often not even this is present, or the ladder is not conveniently located, and so the crane man climbs the lattice work of the runway columns in order to get into his cage—a dangerous practice, to say the least.

There should be provided for every crane runway an elevated platform, from which the operators may easily and safely enter their cages. On long runways two or more such platforms are advisable. For access to these elevated platforms ladders are commonly provided. However where space permits stairways are sometimes installed. Well constructed stairways between the crane columns take up little space and provide safe means of access to the crane platforms. Operators on overhead cranes in some plants are changed on shifts of from four to eight hours, and certainly safe means of reaching and leaving their cages is very important.—R. H. G.

What shall it profit a man should he gain the whole world, and yet lose his own self respect. Real men would rather live on a crust than to do one thing that dishonestly takes from his brother man.

Some men think they are called upon to do things in this world, when it is only their pockets that are itching for more dollars.

It is necessary to look into some men's faces only once to see what is behind the face. Real men are honest under all circumstances; the crooks, only when they think they are being watched, and not always then.

Some men, with a little education along one line, get the queer notion that they know it all. Surely "a little education is a dangerous thing."

Socialism, Bolshevism and I. W. W.ism is much worse among those in higher positions, than among the lower classes. A man who is placed in a position of trust and who wants to destroy everyone unless he "gets his" is a far worse animal that the supposed-to-be lower type that talks the same bunk. Honest men cannot be too careful about associating with this kind. His smile is a leer and his laugh a hiss.

A conscience is one of those things that the man who needs it most, has the least.

EASTWOOD Wire Mfg. Co.

Fourdrinier Wires
Cylinder and Washer Wires

Belleville, New Jersey
U. S. A.

WE ALSO MANUFACTURE

Valves, Unions, Cocks, Fittings, Digester Parts, Castings, etc., for Sulphite Mills from Our Perfection Bronze

The Stickle Automatic Steam Control for Paper Machines

WE wish to emphasize the word "automatic." This with us means that the steam follows changes that come to the sheet from free to hard drying stock or any ordinary changes in weights. A control that does not do this in itself is not automatic. This makes a better sheet of paper. We guarantee to hold the moisture at any point you wish with ½ of 1% change. Furnished on 60 days' approval.

OPEN COIL HEATER & PURIFIER CO.
INDIANAPOLIS, IND.
BOSTON PHILADELPHIA

"TYLER"
CORDUROY CLOTH
for SAVEALLS
GROUND WOOD WET MACHINES
WATER FILTERS
SULPHITE WET MACHINES

Tyler Corduroy Cloth, for use in the paper making industry, has four distinct advantages over other types of screen, namely:

1—It eliminates the necessity of using backing wires.
2—It gives much longer life than fine face wire.
3—There is no chance for stock to collect between the two covers which occurs where a fine wire and a backing wire are used.
4—Eliminating the backing wire, saves considerable time in applying the cloth to the machine.

Tyler Corduroy Cloth is made from phosphor bronze, monel, or nickel wire, and is carried in stock in all widths up to and including 150 inches.

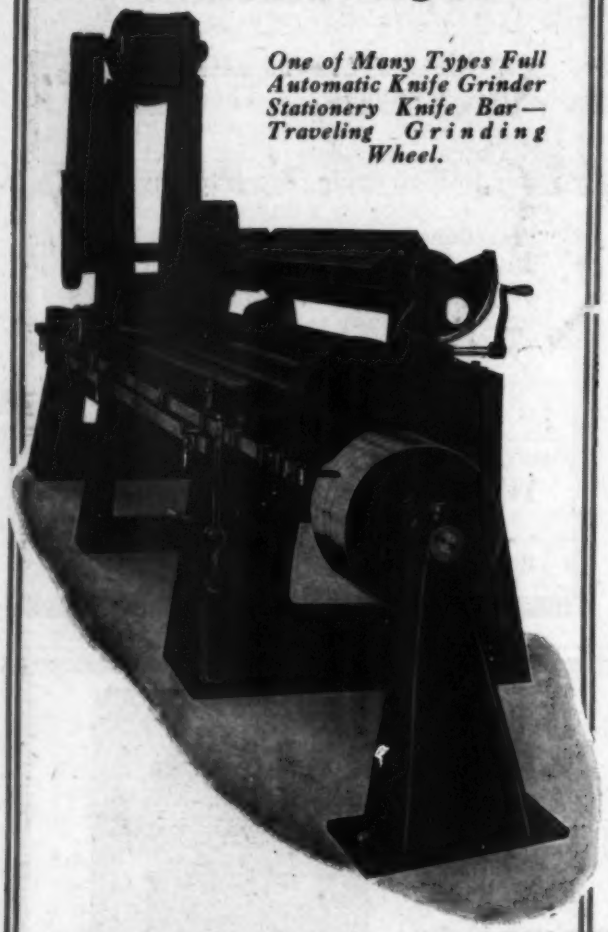
Samples will be sent upon request.

Also Manufacture Fourdrinier Wires, Cylinder Faces, Washer Wires, Backing Wires

The "Tyler" Corduroy Cloth

THE W. S. TYLER COMPANY
CLEVELAND, OHIO

BETTER Knife Grinding at Minimum Expense



One of Many Types Full Automatic Knife Grinder Stationery Knife Bar—Traveling Grinding Wheel.

IN these days of high costs, a comparatively low priced machine of strictest accuracy, of simple construction, but full automatic in every respect, and of heavy, rigid build, insuring long service, offers real economy in keeping all knives from 6-inch to 190-inch, up to highest cutting efficiency. We make all types of grinders for every variety of service in fitting knives, saws, shear blades, etc.

Write for Catalog and commendations on your requirements.

Machinery Co. of America

Big Rapids, Michigan, U. S. A.

Branch: Seattle, Wash.

Fire Drills

(*Continued from page 286*)

often as possible all of the signals mentioned, to insure against possible misunderstanding at a critical time.

Upon reaching the street, the line should be led away to a safe distance to prevent crowding and confusion around the exit, and for this purpose one of the room chiefs or test supervisors from the first or nearest street floor should be assigned to the duty of leading the line away from the building.

Elevator attendants should be instructed to take cars immediately upon the first sound of the building alarm to the floor indicated, and hold themselves subject to the orders of the floor chief. In high buildings of the fire-resistive type, the operator should be instructed to take his elevator into the fire zone and receive passengers, and then if conditions favor such a procedure, discharge them only a few floors below the fire zone. Employes should be instructed to leave at that point and go down stairways. If this procedure can be carried out, much valuable time and many lives may be saved. The usual difficulty, however, is that all stairways and halls are croded so that the elevators must run to the ground.

Assignment of Exits

The assignment of exits will depend primarily upon their number, capacity, and location and to some extent on their arrangement. An exit discharging horizontally into another building or into another section of the same building, which is cut off by a firewall having standard protected openings, will accommodate as many persons as a separate and exclusive stairway of the same width for each story, and with the possibilities of danger greatly reduced.

Where conditions permit, it would be desirable in drills to use the regular entrances for exit purposes on account of their familiarity to the employes constantly using them. In their selection, however, consideration should be given to possible exposure by local hazards, such as proximity to heating and power plants and any hazardous processes or locations connected with the premises. It is also important in arranging the regular exits to allow one or more, if possible, as entrances for firemen. The assignment of exits for different floors should first be based on approximate estimates of their relative discharging capacities, then as a result of actual tests based on those estimates, the distribution to each exit can be revised so that the time consumed will average about the same for all. In these trials every available exit, including those reached by way of the roof, should be considered.

Frequently, the arrangement of exits may be such as to permit a safer and more rapid dismissal from an upper floor by using the regular exits to one of the lower floors, in order to reach an exit discharging on

WE-FU-GO AND SCAIFE

WATER

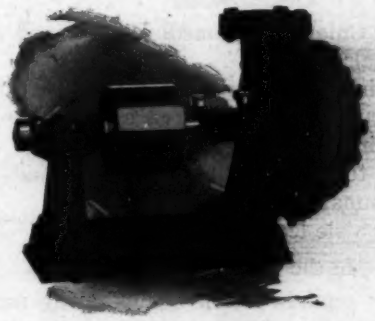
PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO., PITTSBURGH, PA.

AMERICAN-MARSH

Centrifugal Pumps

BELT OR MOTOR DRIVEN



Extra wide ring oiled bearings. Overhanging casing allowing the discharge to be taken at any angle desired. Removable outer head so that impeller may be withdrawn without disturbing the casing. Hydraulically balanced impeller insuring minimum end thrust. Impeller machined all over and turned to make a close running fit with the casing.

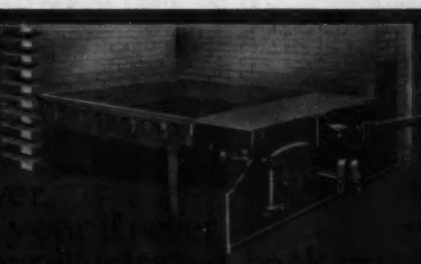
Finished with open runner for handling paper stock.

INVESTIGATE. *ASK FOR BULLETIN No. 25.*
Furnished Promptly Upon Request.

We Also Manufacture **Power Pumps, Deep Well Pumps, Boiler Feed Pumps, Vacuum Pumps, Horizontal Power Air Compressors.**

American Steam Pump Co.
Battle Creek, Michigan
Chicago Office, 1220 Monadnock Block.
New York Office, Whitehall Building, 17 Battery Place.

AJAX
Rocking Grates



15% Less Coal
an increased steam capacity and lower maintenance and labor costs-

VALLEY IRON WORKS
WILLIAMSPORT PENNA.

The Mountain Goes to Mohamet

¶ If you wish to unload pulpwood directly onto your woodpile—

¶ A carload of coal directly into your coal bins—

¶ Remove the accumulated rubbish in and about your wood yard—

¶ Handle any new machinery from the flat cars—

¶ Dig the excavation for any new addition to your plant—

BYERS' Auto Crane

will go right to the job. You do not have to bring the job to it.

Runs like an automobile, using gasoline, steam or electricity for motive power and does all your sling, clamshell, grab, orange-peel or magnet work equally well. It will do all your regular loading, unloading or lifting work at a saving of many dollars in time and labor, paying for itself in a very short time. *Write for Bulletin No. 1016.*

John F. Byers Machine Company

311 Sycamore Street, Ravenna, Ohio

another side of the building. Combinations of this kind should be utilized wherever possible.

For information of all employes, notices should be posted in each room giving full instructions in all matters pertaining to the drills. These notices should be printed in the respective languages of the employes.

The power-plant engineer, upon the first signal of the building alarm, should be instructed to shut off power to machines and shafting throughout the building, excepting in cases where it would affect the operation of the fire pumps, elevators or the lighting system.

Fire Drill Instructions

Fire drills are intended for the safety of operators, and each employe should assist in successfully conducting the drills, realizing that their safety is greatly increased thereby. The stronger should assist and encourage the less vigorous or more timid.

Organization

The Factory Chief is in immediate command when fire alarm signals sound.

Floor Captains are in direct control of each floor, and their instructions should be carefully obeyed.

Floor Captains will designate when and by what egress you are to leave the building. Wait until you receive his command to march.

Follow your aisle leaders.

In the Event of Fire

Immediately send in alarm by operating nearest fire alarm box.

Telephone without delay fire headquarters, and send in alarm from auxiliary box, or nearest city fire alarm box.

When Alarm Apparatus Sounds in Workroom Operatives must

Stop work.

Shut off power.

Stop machines.

Shut off gas and other open flames.

Close doors and windows opening upon or under fire escapes.

Put chairs, stools and other obstructions on top of or under benches to clear the passageway.

Form line promptly with front of column facing the usual egress aisle, and wait word of command from Floor Captain.

At Command to March

March in a rapid, orderly manner from the building, two abreast as instructed, not crowding upon the couple immediately in front of you, following your aisle leaders.

Preserve the interval in line between yourself and couple in front of you.

Retain formation until dismissed or the line is returned to building.

Women and children always have the right of way.

SALES SERVICE
FOR
PAPER MANUFACTURERS

It is well to have behind one's business the sales energy and distributing resources of an organization equipped with ample facilities to render the fullest measure of service.

We Offer Paper Manufacturers the Best Existing Sales and Distributing Service, Backed by the Experienced and Able Co-operation of an Organization of Large Capacity

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INCORPORATED
PAPER MANUFACTURERS' SELLING AGENTS

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Telephones 4784 and 5986 Vanderbilt
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The Mathieson Alkali Works, (Inc.)

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Works: Niagara Falls, N. Y. **Works: Saltville, Va.**

"Eagle Thistle" Brand of Products

Liquid Chlorine

One hundred per cent pure anhydrous for use **with any control apparatus.**

Shipped in 105 lb., 150 lb., 2000 lb. Cylinders and Containers. Also shipped in Tank-Cars when required.

Prompt shipments made due to our large capacity.

Chloride of Lime

Strongest, quickest settling, most stable Bleaching Powder manufactured.

Shipped in 225 lb., 450 lb., 750 lb. drums for domestic trade. **Special wooden lined drums for export holding 400 lbs.**

If you have a problem to solve write us, and we will give same the closest and Promptest attention of our Technical Service Staff.

This is the NASH AIR SHAKE, which will produce a more even shake, and therefore better sheet of paper than can be made by any present method.

Prepare for Normal Times

THIS is the advice of the management of a mill that has never solicited for business. Make your paper better than your competitor and you will get the business. The **Nash** Air **Shake** will do this for you, and then some; but remember the facilities for building this machine are limited to about six each month. First come first served. Some of you must wait, but do not wait too long or you won't be in line. People are not reading ads for amusement, they seek information, and they want it from a man who seems sincere.

I am sincere.

WILLIAM C. NASH
NEENAH, WIS.

Don't

Don't run.
Don't lag behind, breaking up columns.
Don't scream or make unnecessary noise.
Don't laugh or talk.
Don't cause confusion.
Don't remain in toilet or dressing rooms.
Don't return for your clothing.
Don't try to use elevators.
Don't attempt to leave place in line until you return to the building.
Don't attempt to leaving building except in accordance with fire drill regulations.
Don't fail to assist in carrying out instructions.
All Exit Doors must be kept unbolted and unlocked during working hours.

Address by Charles Piez

(*Continued from page* 288)

ganizations whose lawless acts may require suppression or punishment at their hands.

The American people will not tolerate political strikes, nor government by strikes and coercion, and sooner or later will ask for summary legislation against acts which aim to defeat the fundamental fact in American life, that the rights of the individuals end at the polls.

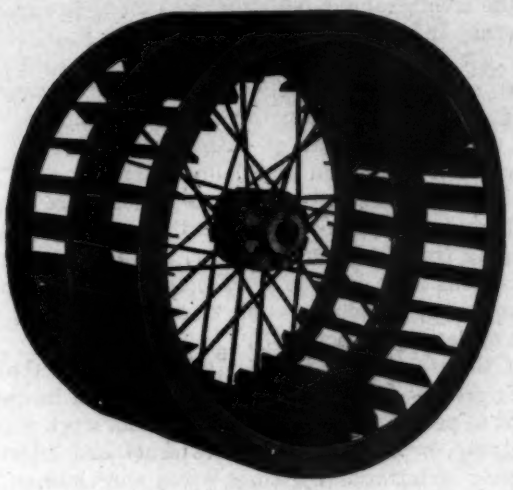
Neither will the people in the long run permit the waste and annoyance of strikes that have been called for corrupt or coercive purposes.

The strike has been of enormous social service, and the right to engage in legitimate strikes, except in the railroad service and in the basic industries on which the actual life of the nation depends, must remain unimpaired. But strikes have become great instruments of oppression, and the general strike, the sympathetic strike, in fact any strike where there is no grievance, where there is no trade dispute involving direct benefits to those engaged therein, and strikes in violation of an arbitration award or agreement, should be declared unlawful.

And it should be made unlawful for any person or association wilfully to induce, aid or support any such strike; and anyone injured or threatened with injury by such strikes should be entitled to all of the civil remedies in law and equity.

I have merely sketched some possible pieces of legislation that may appear justified by conditions later on, so as to indicate to you the extent to which restrictive measures in the Constitution may prevent remedial future legislation.

As to the arguments advanced by Mr. Kerr on the third Section, they would have weight if the premises were true, but in my thirty years' experience as an employer, and with a fairly broad and intimate contact with labor and industrial problems, I have failed thus far to meet any cases of peaceful picketing or peaceful persuasion. Strikes are not always called upon a vote after a plain statement of the issues in-



Bayley

Equipment Increases Paper Mill Efficiency

OUR experienced engineers have spent much time in studying the heating, drying and ventilating problems peculiar to the paper industry.

Their service and counsel is at all times at your disposal. It costs you nothing to learn how Bayley Plexiform Fans and other equipment can improve conditions and reduce operating costs in your mill.

Below are listed some of the specific applications of Bayley Equipment in paper mills:

Forced and Induced Draft Systems, Pneumatic Chip and Ash Handling Systems, Cooling Systems for Electric Generators and for Calenders, Absorption Systems, Forced Heating and Ventilating Systems, Dust Collecting Systems.

The Bayley engineers will gladly furnish plans and estimates specifically for your plant. Or write for the Bayley Bulletins.

Bayley Mfg. Co.

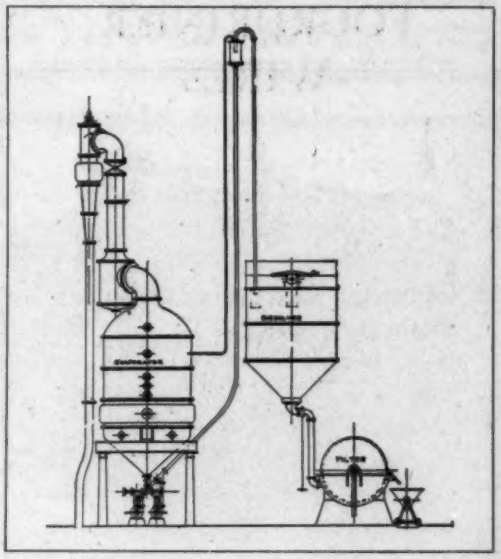
732 Greenbush St., Milwaukee, Wis.

Apparatus for Continuous Removal, Filtering and Washing of Precipitated Salts from Evaporators

Particularly desirable for use in connection with diaphram cells

THIS apparatus, backed by a number of years of successful service, is intended to make what is now generally an intermittent operation continuous, and in a large sense automatic. Moreover, the apparatus is of a character requiring no more attention than can be given it by the man in charge of the evaporator. In other words, it can be operated without extra labor.

One of the most important features is that it permits continuous operation of evaporators



without periodic drawing off and refilling, consequently it contributes to minimum steam consumption by doing away with the intermittent cooling and reheating of batch charges as drawn into the evaporators.

Glamorgan Pipe & Foundry Co.

Lynchburg, Va., U. S. A.

The
LINDSAY
Wire Weaving
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Cylinder Covers and Other
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volved. In fact, some of the most disastrous strikes have been called upon the vote of but a small fraction of the membership. Nine hundred men were at the meeting in Seattle in January of last year, when thirty thousand shipyard workers were called out, and the strike of the Steel Corporation workers, judging from reports of the Senate Committee, was not called as the result of free choice of the men involved full discussion and deliberation.

Not all strikes are just, in fact, some are in the highest degree unfair and unjust; yet in every case, judging from Mr. Kerr's prayer, the great power of the unions to do damage to the employer shall remain unimpaired, without possible chance of recovery for loss or damage inflicted.

If the men desire to quit for any reason, that is their present privilege, but they should not have the right to persuade others to refrain from work with a bludgeon, or through the more cruel and effective method of intimidating their wives and children.

A strike is not exactly an afternoon tea in which conversation is plentiful, but harmless. It is not as a rule, as these gentlemen well know, conducted through persuasion and peaceful picketing; but it involves the absolute denial of the right of the employer to conduct his business, and a denial of the right of other men to remain at work or to seek work. A just cause will win through public support, in the face of an unfair employer, and an unjust cause should not be permitted to prevail through intimidation and violence.

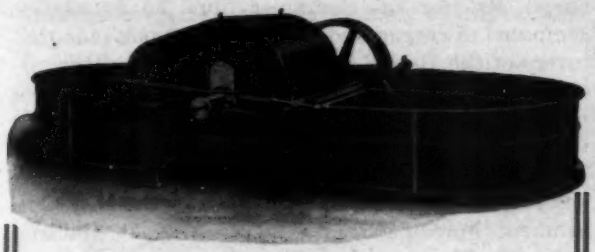
Strikes will exist so long as industry exists; for difference of opinion as to conditions, differences as to the proper division of the profits, will remain, no matter what the character of ownership or industrial scheme of management.

It is in the very nature of industry that organized labor and the employers shall compete for the lion's share of the profits, but the trade unionist has always recognized the right of the investor and the management to a sufficient portion of the profits to continue the industry and keep the opportunity for employment open.

The Communist, however, denies the right of returns to both the investor and the management, and is prepared to go the limit to bring about revolutionary changes in our industrial system. And the Communist's influence is by no means a small one in some of the existing labor organizations. It is on that account that I feel that future legislation will look toward the imposition of greater responsibility upon labor organizations, and will not be inclined to grant wider authority or greater power. Your Committee may well have this in mind in framing the provisions of the new Constitution.

A New "Drum Tester"

A new "Drum Tester" or box testing machine has recently been installed at the Mellon Institute, Pitts-



"Dayton"
Beating Engines
are Built
for
Heavy Duty

Dayton Beater and Hoist Co.
DAYTON, OHIO

Jenssen
Two-Tower
Acid
System

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Installations
in operation or under construction on this Continent or Abroad

G. D. Jenssen Company
200 Fifth Avenue
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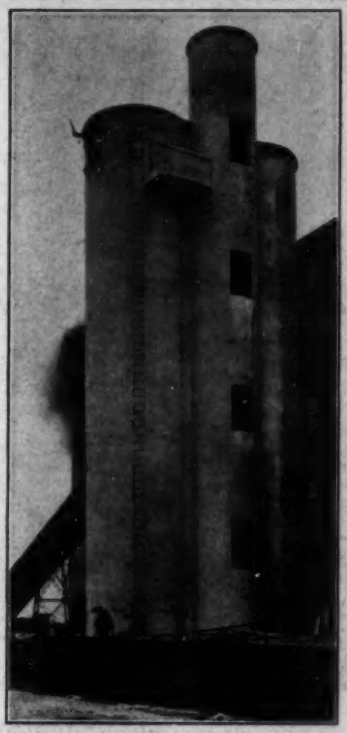
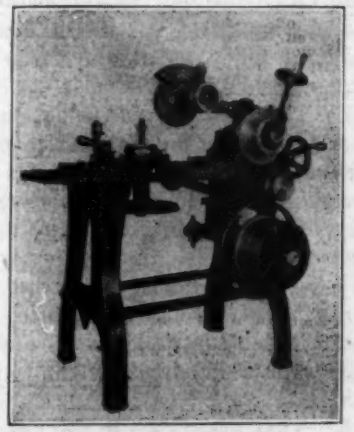


Jenssen Acid Towers at Great Northern Paper Co. Mill at Millinocket, Maine

The Best Grinder
The Standard Koegel
Save money by sharpening your own knives

Costs less to do it yourself and you get better work and more of it if you use only sharp cutters.



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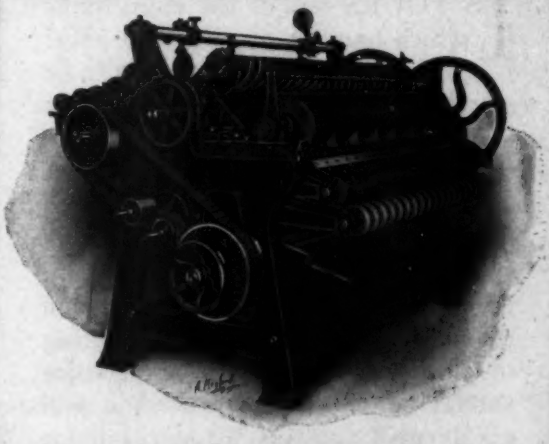

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Single, Duplex, and Diagonal

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PATENT TOP SLITTERS

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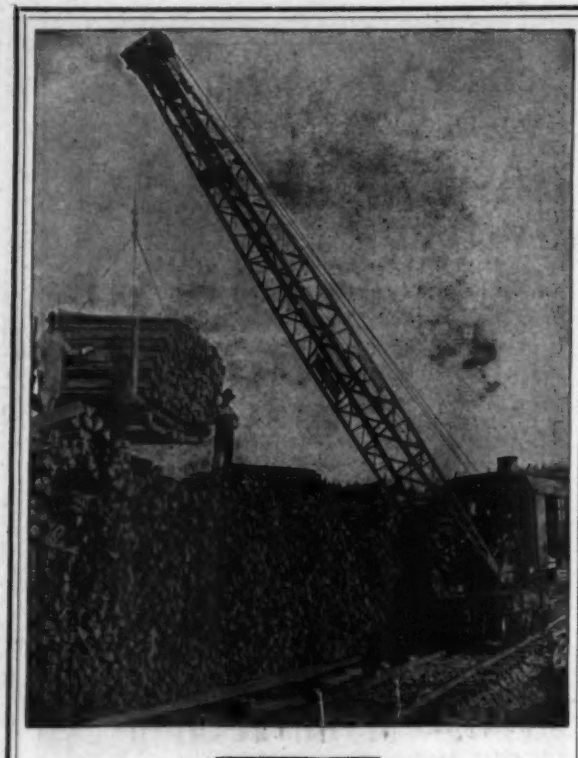


BROWNHOIST

Handling Materials at the Mill

IS YOURS one of the many mills which handles considerable pulp? Some of these have found it to be more rapid and economical to do this handling with a Brownhoist locomotive crane. A Brownhoist will not only place the pulp wherever it is needed, but will handle your coal, switch the cars and take care of innumerable jobs which come up around the yard. If you have much handling to do, our long crane experience should be of use to you. We will gladly give you any information for the asking.

The
Brown Hoisting Machinery Co.
CLEVELAND, OHIO, U.S.A.

Engineers and Manufacturers of Heavy Dock Machinery, Bridge Cranes, etc., as well as smaller Cranes and Hoists

Branch Offices in New York, Pittsburgh, Chicago and San Francisco.

burgh, Pa., for the Container Club, an association composed of corrugated and solid fibre box manufacturers of the United States. The design of the machine is such that the railroad usage which a box may meet in a 2,000 mile haul can be duplicated in four or five minutes.

The first machine of this kind—known as the drum box testing machine—was designed by the U. S. Government Forest Products Laboratory at Madison, Wis. The Mellon Institute installation is an improvement over the original tester in that the inconvenience of overhead pulleys and shafting has been done away with by the substitution of a reduction gear for cutting down the motor speed to the drum speed of 2 R.P.M.

A valuable field of investigation, and scientific study of the construction and materials of packages is opened up by the new machine, such as best methods of interior and exterior packing for fragile or irregular shaped objects.

Forestry Program

(*Continued from page 284*)

cated to recreation and to the protection of the wild life of the forest. The remaining forest lands should be utilized both for direct returns from timber and indirect returns from game and recreation.

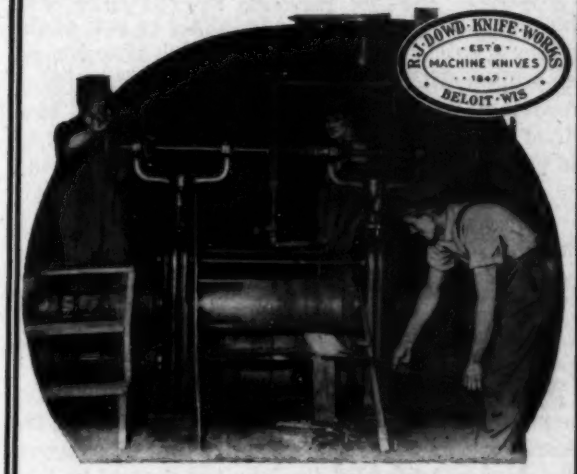
5. That protection of the forest from fire and other destructive agents is fundamental, and therefore organized fire protection should be state wide. Private owners should share an equal burden with the state in forest protective measures in proportion to the area of timber land owned and the amount of protection given. That the state be empowered to cooperate fully with the Federal Government in plans for fire protection.

6. That the commission and the various departments empowered to carry out the conservation laws of the state shall be given authority after due procedure to determine regulations necessary to protect and develop those natural resources. No state law should attempt to define methods and details of protection, management, etc.

7. That industries dependent upon the forest may be permanent in the state, there shall be such adjustment of taxes upon forest lands as will insure the permanency of the private ownership of forest land. This to be done either through the taxing of land and timber separately or by the timber tax being collected as a yield tax at time of cutting, or by the Federal Government through the State, or the state itself assisting in supporting county and town government, later to be reimbursed by the collection of the yield tax.

8. That assistance in the practice of forestry be given the private owner through the preparation of working plans, supplying of planting material, and supervision of silvicultural operations free of charge or at the lowest possible cost when requested. That

Dowd Knives



The cutting edge of a DOWD PAPER CUTTING KNIFE is keen and smooth. It lasts—has to, because it is made to last—from best tool steel, by skilled workmen, in the way proven best by seventy years' experience of knife making.

¶ Dowd Knives cut costs in the cutting room of a mill because of the smooth operation and satisfactory results. Operators like Dowd Knives. They have known the Dowd product for years and recognize them as best. Ask your men.

¶ The name Dowd on a knife is more than a mere label, it is a mark of quality—an honor mark—and is your guarantee that you are using the best knife you can buy. Order paper cutting knives by name, but be sure the name is Dowd.

Write Dowd of Beloit on your knife problems

R.J. Dowd Knife Works
Makers of better cutting knives since 1847
Beloit, Wis.

Remember
WM. A. HARDY & SONS
FITCHBURG, MASS.
Originators and Oldest Manufacturers
OF THE
Cast Bronze Screen Plate
ALSO SPECIALIZE IN
Acid Resisting Digester Parts

SCREEN PLATES *and* **DANDY ROLLS**

Watermarking a Specialty

Central Manufacturing Co.
The Quick Service House
KALAMAZOO MICHIGAN

The "Hamilton" Felt
is making records that we are proud of on many paper machines.
A trial is invited

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HAMILTON, OHIO

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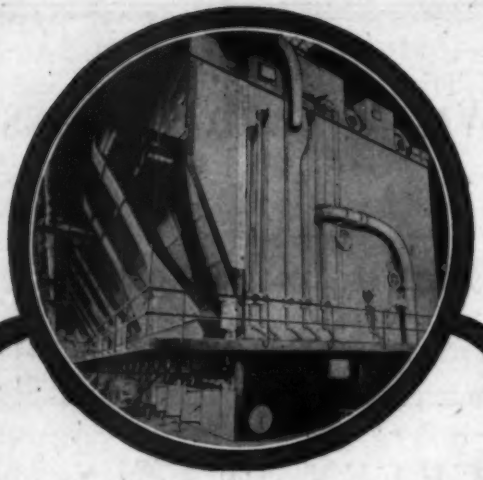
Barking Drums

Green Bay, Wis.



Keeping the World's Largest Boilers Operating at High Efficiency

When engineers design boilers of 2,350 H.P. and over, they find it necessary to construct enormous, many-galleried boiler rooms, equipped with elaborate coal and ash-handling systems, and fitted with many delicate measuring instruments. The initial cost of such plants may run into hundreds of thousands of dollars.

To justify this investment — to protect it — to earn dividends upon it — it is absolutely essential that the boilers continuously produce more steam per pound of coal than would normally be obtained with the operation of smaller units. High operating efficiencies being not merely desirable, but *imperative* if the plant is not to prove a white elephant, how are they to be obtained?

Through Clean Heating Surfaces!

Nearly, if not fully, 90 per cent. of the world's boilers of 2,350 H.P. and over, are equipped with Diamond Soot Blowers.

(Names of plants and details upon request.)

This fact is of tremendous importance to every boiler operator. If Diamond Soot Blowers are essential to the economical operation of the world's largest boilers because of their ability to save fuel and labor, and to increase boiler efficiency, they are just as necessary on smaller boilers, and just as desirable from an investment standpoint.

Diamonds usually pay for themselves twice over in a year. You owe it to your plant to obtain full information. Ask for Bulletin 280.

DIAMOND POWER SPECIALTY COMPANY
Detroit, Michigan

Diamond

SOOT BLOWERS - SAVE 4 to 8% FUEL

provision be made for the State to take charge of reforesting operations upon private land, when requested to do so, the cost thereof to be a lien upon the crop, this lien to be discharged by the owner upon payment of cost and carrying charges at a low rate of interest. That the State be empowered to take over at a fair valuation and administer as part of the system of public forests, any land which after competent examination is classified as suitable for timber growing only in case the owner refuses to avail himself of the opportunities and assistance provided by the public to encourage forestry upon private lands.

9. That adequate support be given by the state to educational and experimental work in forestry, both that the state may appreciate the necessity of proper development of the forests and the vital character of the forests and their relation to water storage, fish and game, health and recreation and the great industries depending upon them.

10. That all state property under the control of the conservation commission be capitalized upon the records of the commission in order that all expenses in connection with the development thereof and returns therefrom may be properly accounted for as in the other legitimate business undertakings, so that the people of the state who furnish the funds for the undertaking and enjoy its results may know at any time what their investment is and what yield may be expected therefrom.

* * * *

In Conclusion

Your Committee submit the foregoing as their mature judgment as to the means best adapted to promote the maintenance of the timber supply and recommends that they be authorized to proceed upon their own initiative and in cooperation with other indivduals and agencies to secure the passage of the legislation proposed and that funds be provided for the actual expenses of the Committee in carrying out this program.

Combustion Losses

(*Continued from page* 281)

by the excessive losses caused by the heat carried away in the chimney gases in the latter. The amount of combustible in the soot and cinders deposited upon the tubes and in various parts of the settings, seldom exceeds 1 per cent of the calorific value of the fuel.

Radiation and Unaccounted for Losses

These losses are determined by simple arithmetic, being the difference between the sum of heat represented in the steam and the losses previously mentioned, subtracted from the 100 per cent total heating value in the fuel. Consequently, unless careful attention is given to accuracy of determination of other losses, the figures arrived at for this loss will be in error.

Radiation losses should not exceed 2 per cent and,

Ticonderoga Machine Works

TICONDEROGA, N. Y., U. S. A.

MANUFACTURERS OF

WARREN IMPROVED CALENDER DOCTORS

With Flexible Blades, Universal Adjustment and Control
(PATENTED)

WARREN IMPROVED PATENT DOUBLE DRUM WINDERS

Patent BALL VALVE Hydrant
Stock Circulating Systems *and*
other Paper Mill Specialties

SEND FOR OUR BULLETIN

Paper Mill Lubrication Raised to the Highest Degree of Efficiency

In order to "make good" day after day in paper manufacturing a lubricant must be able to "stand up" under excessive bearing pressure and resist the heat transmitted by steam as well.

Extensive use of Keystone Grease in large paper mills throughout the country conclusively proves it to be unparalleled for the lubrication of both calender and finishing rolls of any character, particularly where unusual heat conditions exist.

KEYSTONE GREASE

Write today for our free Bulletin Number 23.

The Keystone Lubricating Co.

Executive Office and Works:
Philadelphia, Pa.
Established 1884

New York, Boston, Pittsburgh, Chicago, St. Louis, Denver, San Francisco, Minneapolis, Houston

Davis for Boilers

BOILERS

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UNUSUAL OFFERING

Taken Over From Du Pont Powder Co.'s Plants and Other Plants

Practically as Good as New—for Prompt Shipment

EVERY BOILER GUARANTEED

Let us handle your boiler requirements. We overcome high prices and slow deliveries on new boilers. Purchase now and take advantage of this stock, which is moving rapidly.

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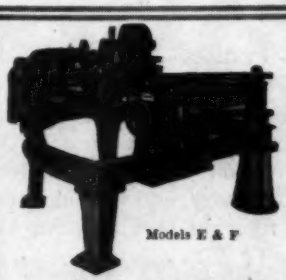
1122-1123-1124 HARRIS TRUST BLDG., CHICAGO, ILL.



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Cold Pipe Bending Machines

Standard of the world.

Bends all sizes of pipe from ⅛ in. to 8 in.
Hand or motor operated.

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PHOENIX SOAPSTONE FIRE BRICK

Large Arch and Square Blocks a Specialty
All Shapes and Sizes

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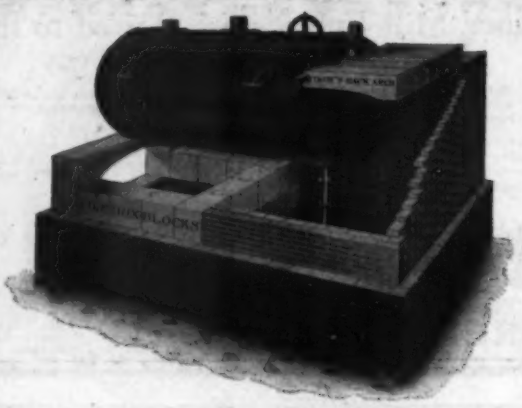

Avoid Shut-Downs

Caused by Boiler Setting Failures

It is just as easy to have a boiler setting that will give the maximum service with a minimum of repairs as to have one that constantly requires patching and occasionally causes a complete lay-off.

"STEEL MIXTURE"

BOILER SETTINGS

will outwear at least two small brick linings and will save money as well as trouble occasioned by the maintenance and renewal of settings.

Made for Door Arches, Fire Box Linings, Back Arches, Furnace Roof Arches, Blow-Off Pipe Protectors. Any type of boiler can be fitted up without delay.

Send the coupon.

McLEOD & HENRY CO.

TROY N. Y.

McLeod & Henry Company, Troy, N. Y.

NEW YORK
BOSTON
DETROIT

Gentlemen:
Please send us complete information about the "Steel Mixture" boiler settings, with reference particularly

to .....

for a .....*boiler.*

Name .....

Address .....

.....

as a matter of fact, do not, with well designed, well insulated boiler furnaces. On the contrary, with poorly installed settings, where insulation is not properly attended to, radiation losses may amount to as much as 6 to 8 per cent.

TABLE III

Heat absorbed and loses itemized	Highest attainable efficiency	Excellent practice	Good practice	Average practice	Poor practice
	Per cent of Calorific Value of Coal as fired				
Heat absorbed by boiler...	89.86	80.0	75.0	65.0	60.0
Loss due to free moisture on coal	0.50	0.5	0.6	0.6	0.7
Loss due to hydrogen in coal (evaporation of H_2O)	4.20	4.20	4.30	4.3	4.4
Loss due to heat in dry flue gasses	5.33	10.0	13.0	17.5	20.0
Loss due to carbon monoxide	0.00	0.2	0.3	0.5	1.0
Loss due to combustible in ash and refuse.....	0.00	1.5	2.4	4.5	5.5
Loss due to heating moisture in air.....	0.11	0.2	0.2	0.3	0.4
Loss due to unconsumed hydrogen, hydrocarbon, radiation and unaccounted for	0.00	3.0	4.2	7.2	8.0
Calorific value of coal....	100	100	100	100	100

It is undoubtedly true that this loss equals a full 4 to 6 per cent in the average plant and that it could be cut squarely in two with a comparatively small expenditure for insulating material.

Heat Balance

The sum of all the losses and the heat absorbed by the boiler when distributed in a table or on a graph gives us the best balance. As the operating engineer, when searching out means for the elimination of losses, is concerned with "coal as fired," any general representative heat balance, such as is shown in Table III, is of value for purposes of relative, but not absolute comparison.

The losses which we have been considering, cover continuous operation of the boiler at normal or high rating. In addition, there are other important sources of loss in operation, such as stand-by losses, blow-off losses, losses due to leaky traps, valves, etc. These will all be discussed later. In our next paper, we will take up in greater detail the determination and control of operating losses through the use of instruments.

Motor Trucks

(*Continued from page* 290)

450 horses would be needed to handle the work of the nine trucks that they estimated could handle the job. Hard winters limit team travel over Maine roads to a six-month season yearly, and the engineers considered this factor in figuring feed bills for the teams.

Motor Trucks Selected

After careful investigation, the engineers selected motor trucks, and the company, in 1914, purchased eight units of 5-ton and one of 2-ton capacity,

When it is a matter of

CHIPPER and BARKER KNIVES;
RAG CUTTER, ROTARY CUTTER
and PAPER TRIMMING KNIVES,
FLY BARS and BED PLATES
for BEATERS and WASHERS,
JORDAN ENGINE FILLINGS,

THINK OF

BOLTON QUALITY

JOHN W. BOLTON & SONS, Inc.
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Intensive specialists in the manufacture of uniformly high grade machine knives for the pulp, paper and board industry

WIDNEY MODULIMETER
A TEST

MEASURES EVERY PHYSICAL QUALITY IN MATERIAL
Paper, Felt, Rubber, Etc.
Write for our booklet—just out—and the story of the development of this universal testing device.

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TEST LABORATORIES
Physical Tests and Research
352 S. Jefferson St. Chicago

Wm. D. Kurz
Electrical Inspector

Contracts made for inspection service by the year. Know the paper mills thoroughly and have had 35 years of this class of service. Many Wisconsin mills now under contract.

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Felts and Jackets
Manufactured By
APPLETON WOOLEN MILLS
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Do You Know That
Claflin Continuous Beaters
Have 3½ times the efficiency of other beaters in use today for Beating, Brushing and Refining Paper Stock?
For Increased Production, Greater Economy, Stronger, Finer, More Uniform Pulp, the CLAFLIN CONTINUOUS BEATERS will more than satisfy.
Ask Us for Our New Catalogue
THE CLAFLIN ENGINEERING COMPANY
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DO YOUR HOISTING WITH
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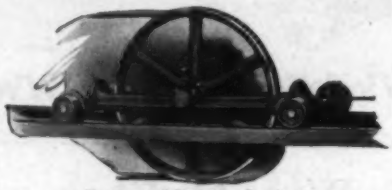
NORTHERN ENGINEERING WORKS, DETROIT, MICH.

THE HILL CLUTCH CO.

AMERICAN SYSTEM ROPE DRIVES



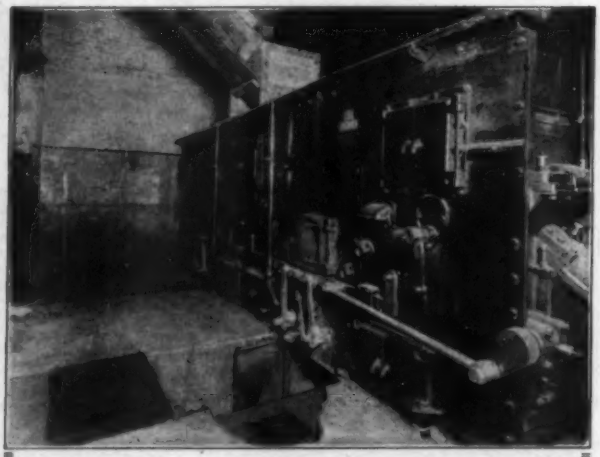
Horizontal Tension Carriage

Everything from a small cast iron pulley to Complete Power Transmission Machinery Equipment for

Belt Rope DRIVE *Gear Chain*.

THE HILL CLUTCH CO.

CLEVELAND, OHIO



Speed the Ashes

Feed the ashes into the intake before the boiler pit. Zip! Instantly they are in the disposal tank outside.

AMERICAN STEAM ASH CONVEYORS

handle ashes fast. They get the job over in a hurry, and cut costs 50-75%.

You can do the same in your plant. Proof in Catalog P.

American Steam Conveyor Corporation

Coal and Ash Handling Equipment

Chicago 139 W. Madison St.

New York 110 W. 40th St.

equipped with platform bodies. One 5-ton truck had been purchased the year before. Officials figured that the nine 5-ton trucks would save, in initial cost and economy of operation, during the first year practically the entire cost of the $250,000 road.

The trucks went to work in the spring of 1915 on a road with some grades so steep that they had to be let down with a cable attached to a mechanical "snubber." During the two years that it took to complete the work, every truck in the fleet delivered in full measure the service that the engineers had laid out for it, efficiently and economically. All the construction material for the dam—and one item alone was 50,000 barrels of cement—the steel, machinery, food for men and animals, went over the remade "tote road" in motor trucks.

The work on the dam finished, the truck fleet was ready for more work. With some 4,000 or 5,000 employees in 60 logging camps throughout the state, the company put the trucks at work hauling supplies to these camps. Here again they proved their efficiency and economy. W. Hilton, head of the company's division of forest engineering, says the trucks operate at 17 cents less per ton-mile than do teams of horses.

The trucks that went into the service of the Great Northern company in 1913 and 1915 have run more than 60,000 miles each. A 5-ton truck, bought in 1918, has run between 10,000 and 15,000 miles in the company's work. The trucks work on through the winter up to the time when there is sufficient snow for sledding.

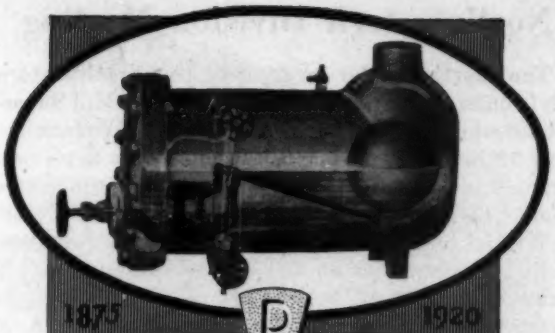
Trucks haul to the camps from the main supply depots at Kineo, Greenville and Lily Bay. The most distant camp is 51 miles from Kineo. Trucks in the Kineo district in 1918 covered 42,000 miles, carried 2,000 passengers (principally cutters) and hauled 3,300 tons of freight. In the Grant Farm section in the same year trucks in the company's service traveled 35,000 miles, hauled 4,900 passengers and transported 2,400 tons of freight. Most of the passengers were hauled in a bus body on a 2-ton truck.

Advantage in Case of Fire

Company officials point out that one of the most important advantages of the use of trucks lies in the ability of them to get men quickly to the scene of an incipient forest fire. Fire is the terror of the timberman. Fanned to a good start, it may leave miles of devastated area in its wake.

F. A. Gilbert, manager of the spruce wood department of the Great Northern Paper Company, thus sums up the work of trucks in his company's service:

"Our trucks average 12 hours of work a day, running a little under 100 miles each. At times they have been run day and night, but at all times they have been efficient. We have nothing but the highest praise for them. They are well built and serviceable and their maintenance cost is low."



1875 D 1920

THE DAVIS STEAM TRAP is one of many Davis Steam Savers that have found profitable application in Paper Mills. Note the large float, the sensitive leverage, the balanced, renewable valves, and valves and seats of Tobin bronze, the by-pass, and the working parts all attached to the cover and removable with it. Write to the G. M. Davis Regulator Co., 414 Milwaukee Ave., Chicago, for a complete catalog.

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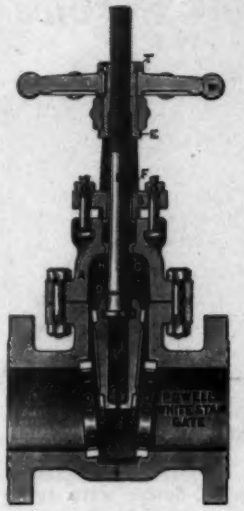
STEAM SAVERS SINCE 1875

POWELL VALVES

For Pulp and Paper Mills



Powell "White Star" Gate Valves

For Steam, Water, Gas, Oil, Air or Chemicals, — To Meet Every Requirement.

Gate valves with rising or non-rising spindles. Screwed or flanged ends—of brass, iron or steel.

Ask your dealer for "Powell" Valves—or write us.

THE WM POWELL CO.

DEPENDABLE ENGINEERING SPECIALTIES

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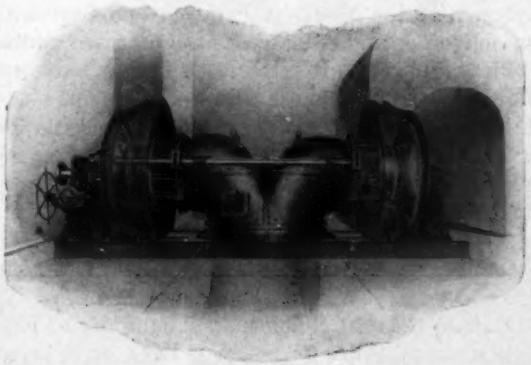
SMITH HYDRAULIC TURBINES



Accompanying view shows one of eight horizontal shaft "SMITH" Turbine units in successful operation in the Cornell Wood Products Co. mill at Cornell, Wis. Each unit develops 1550 H.P. under 37' 6" head.

FOR STABILITY AND EFFICIENCY SMITH TURBINES ARE UNEXCELLED

If interested, write for Bulletin "S"

S. MORGAN SMITH CO., York, Pa.

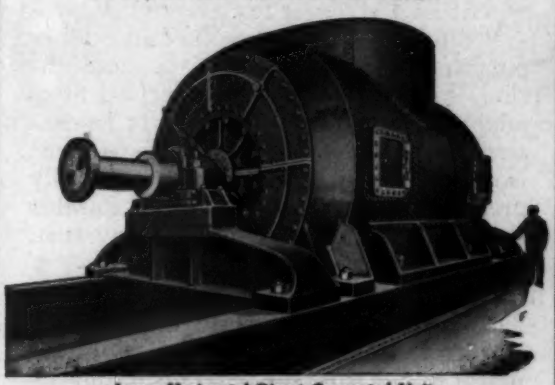
BRANCH OFFICES:

176 Federal St. BOSTON — 76 W. Monroe St. CHICAGO — 405 Power Bldg. MONTREAL

Leffel Turbine Water Wheels

High Speed — High Horsepower — High Efficiency

Vertical and Horizontal Designs



Large Horizontal Direct Connected Unit

Write for Bulletin 54

The JAMES LEFFEL & CO.

SPRINGFIELD, OHIO

Boston Office: Room 610 Compton Bldg., 161 Devonshire Street, Boston, Mass.

SALES ENGINEERS

B. F. Groff, 556 Woolworth Bldg., Lancaster, Pa.
H. H. White, 1583 Fourth Nat'l Bank Bldg., Atlanta, Ga.
William Hamilton Co., Ltd., Peterboro, Ont., Canada

The Cost of a Paper Machine Wire Can Be Figured Only on the Basis of Service Rendered

1—Rapid strides are being made today in combining materials to produce a result which will give greater service.

2—A metal has been perfected for the manufacture of wires, other than fourdriniers for paper and pulp mills called NICKEL ALLOY.

3—**O'NEILL NICKEL ALLOY** wires have demonstrated by their performance in some of the largest mills of this country, that their life and service show approximately 400% better investment for the pulp and paper manufacturers. Upon request testimonials will be gladly submitted.

4—We recommend that you try the **O'NEILL NICKEL ALLOY WIRES.** They cost more but they are worth it.

5—We also manufacture very durable paper machine wires of brass and bronze in plain, double warp, triple chain, and twisted weaves.

Joseph O'Neill Wire Works
Southport Conn., U. S. A.

New Sand Filter

A SPECIAL filter for paper mills, producing all the results the paper manufacturer desires. It is a modification of the well known Hungerford filter adapted to paper mill use. It is constructed of concrete, strictly wrought iron pipe, brass strainers and especially prepared silica sand. It is as durable and efficient as can be built at any cost. It can be sold at a very low figure.

This filter gives perfectly clear water, washes thoroughly, does not require renewal of the sand bed, is absolutely reliable in the performance of its duty and requires a minimum amount of attention.

Send for full particulars

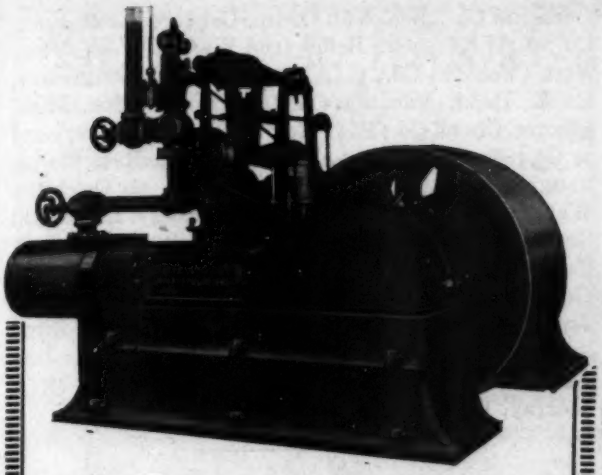
Hungerford & Terry, Inc.
PHILADELPHIA, PA.

Northwestern Division Meeting

The fourth regular meeting of the Northwestern Division of the American Pulp and Paper Mill Superintendents' Association was held on Wednesday, May 12th, at Menasha, Wis. An elaborate day's program was prepared by the arrangement committee consisting of John T. Hercher, chairman; Wm. Nash, G. W. Mericle, Earl Sharpless and Wm. Harrison, each of whom was on the job continually to help extend the hand of hospitality. The morning was given over to the regular meeting, President R. J. Cunningham presiding. There were fifty-six present. Mr. Henry Bert of the Downing Box Company, scheduled to read a paper on "Container Box Board," was compelled to be absent. He sent his paper to the committee, however, who requested Mr. A. Scott Dowd of The Paper Industry to read it in his place. Mr. C. P. Ramsden of the Beloit Iron Works then addressed the meeting on the subject of "Paper Mill Machinery." This created a pleasant discussion in which Mr. P. J. Lamereaux of the Marinette and Menominee Paper Co. took an interesting part. President Boyce talked at length about the convention to be held in Buffalo on June 4-5 and urged everyone to boost for a big attendance. The meeting adjourned at 12 o'clock, and after luncheon at the Hotel Menasha, auto trips were made to the following mills: The Lakeside Paper Co., Geo. A. Whiting Paper Co., John Strange Paper Co. and the Menasha Printing and Carton Co.

At seven o'clock, the banquet was spread at the Hotel Menasha. Mayor T. E. McGillan delivered an eloquent address of welcome followed by some interesting short talks around the tables. Mr. L. W. Claybourn of the Menasha Printing and Carton Co. then delivered a most interesting illustrated address on "Plate Making as Related to the Paper Industry." Following is a list of those who were present:

Eugene O'Brien, Wm. Davis, Dells Paper and Pulp Co.; Jack Pfister, Waldorf Paper Products Co.; Paul Sievert, P. J. Lamereaux, A. G. Stone, Marinette and Menominee Paper Co.; R. J. Cunningham, W. T. Fogarty, D. J. O'Connell, Northern Paper Mills Co.; D. A. Morrisy, Island Paper Co.; L. W. Claybourn, Earl Sharpless, W. B. Harrison, Menasha Ptg. and Carton Co.; Ed. Shields, A. T. McFarlane, Green Bay Paper and Fibre Co.; George Lenz, John Hoberg Paper Co.; Wm. Nash, Otto Jorgenson, D. E. Stowe, E. J. Lachman, Lakeside Paper Co.; G. W. Mericle, Whiting Paper Co.; John Hercher, John Strange Paper Co.; George Bonner, Falls Mfg. Co.; Rudolph Meyer, Joe Zelinski, McGillan-Asmuth Paper Co.; Fred C. Boyce, Wausau Paper Mills Co.; C. K. Andrews, Itasca Paper Co.; Thos. G. Johnson, Minnesota Paper Co.; W. J. Dolan, Rhinelander Paper Co.; W. A. Kelly, Marathon Paper Mills Co.; F. E. Pearson, Munising Paper Co.; P. A. Smith, Combined Locks Paper Co.; Jas. Foxgroven, Western Paper Makers'

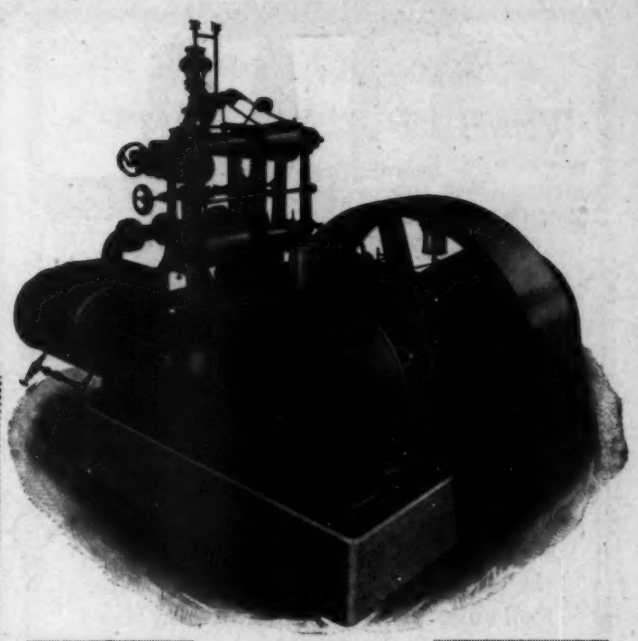


Variable and Constant SPEED ENGINES

Paper Mill Economy is assisted very materially by the installation of High Grade Variable Speed and Constant Speed Engines.

Send for List of Installations and Catalogs

CHANDLER & TAYLOR COMPANY
Indianapolis, Indiana.

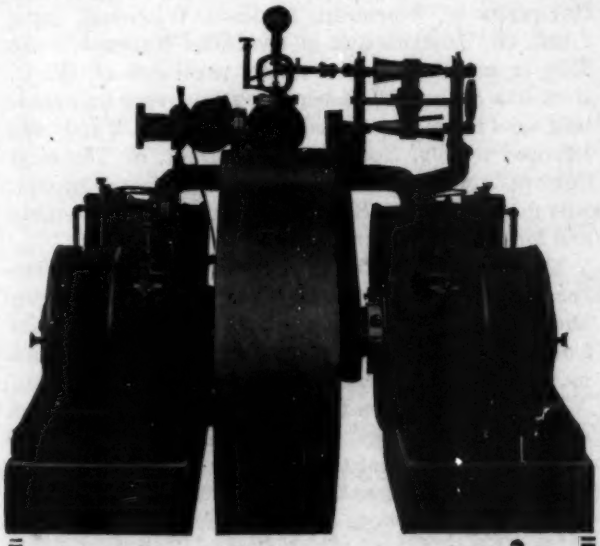


Variable Speed Engine

The engine illustrated above is especially designed to drive paper machines, giving continuous and reliable service. A patented safety device protects your employees and plant.

THE BROWNELL CO., Dayton, Ohio

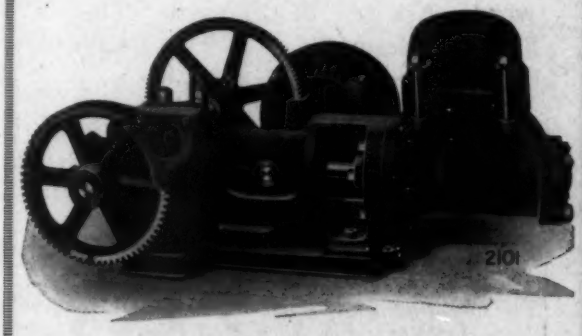
SEND FOR BULLETIN E-4



THE BALL VARIABLE SPEED ENGINE

solves the problem of your variable speed drive. Its reliability results in maximum production. That's why *one in every three of these engines is a repeat order.*

Ball Engine Co., Erie, Pa.

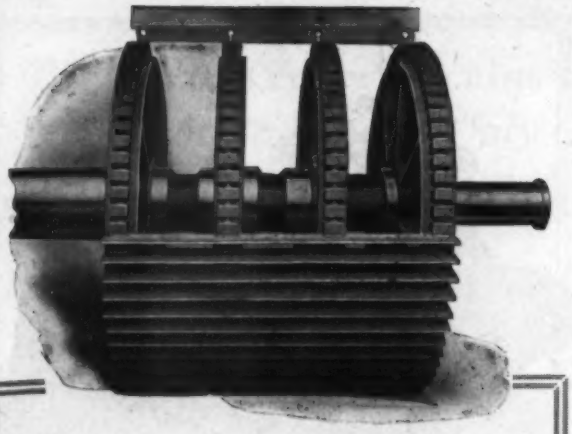


WE CAN furnish this pump equipped to handle any liquid that will flow through a pipe. The wearing parts are all liberally proportioned for the service required. All valves are above the piston and easily accessible by the removal of the water chest cover.

Send for Catalogue 127

New York Sales Office, 141 *Broadway*

DEAN BROS. STEAM PUMP WORKS. **INDIANAPOLIS.**



NEARLY 400 Dilts Bandless Beater Rolls, now in service, attest daily to the value of this, the first and only successful Beater Roll built for Board, Roofing and Hard Fibre. Why not profit by others' experiences and install it **now** rather than change to it **later** after loss and expense with the old type of banded rolls?

This Bandless Roll, filled with Dilts Special Alloy Fly Bars, is the **last word.** Ask any of the users. They are our salesmen.

Dilts Machine Works, Inc.

Fulton, N. Y.

Manufacturers of

Beating and Washing Engines
Agitators, Fly Bars, Bed Plates
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Chemical Co.; Wm. Van Ordre, Ockeely Steam Spec. Co.; C. T. Ramsden, Beloit Iron Works; C. W. Boley, Vera Chemical Co.; C. A. Croxen, C. F. Longfellow, C. A. Dodd, Vacuum Oil Co.; Ray White, Mich. Electro. Chem. Co.; H. C. Reimer, Kutruff, Peck, Lord & Co.; Frank Leavens, Neenah, Wis.; Mark Kavanaugh, Manhattan Rubber Co.; A. L. de Oeloquin, Waterbury and Sons Co.; Frank B. Eilers, Eilers Mill Supply Co.; A. W. Nason, Albany Felt Co.; Edw. B. Fritz, A. Scott Dowd, The Paper Industry; W. H. Guidotti, Heller and Merz; Chas. F. North, Sr. and Jr., Green Bay Foundry and Mach. Co.; W. D. Kurz, Appleton, Wis.; O. L. Berger, G. D. Jenasen Co.; J. F. Kern, Great Western Smelting & Ref. Co.; D. J. Murray, D. J. Murray Mfg. Co.

Cost Association Meeting

The Cost Association of the Paper Industry held a very enjoyable two-day meeting at the Hotel Cleveland, Cleveland, Ohio, May 17 and 18. On Monday morning at 10:30 a. m. the first meeting was called to order by President D. E. Burchell, who gave a talk on the advantages of this association, which has grown to be an important factor in the paper Industry. At 11:00 a. m. Mr. H. E. Surface, valuation engineer, U. S. Bureau of Internal Revenue, Washington, gave a talk on the "Discussion of Tax Questionnaire." At 2:00 p. m. Professor F. H. Elwell, University of Wisconsin, Madison, Wisconsin, gave a talk on "Distribution of Overhead Expense." At 2:20 p. m. Mr. F. B. Snyder, president of W. C. Hamilton & Sons, Philadelphia, gave a very enjoyable talk on "From the Outside Looking In," and was followed by Mr. Ross Campbell, Dept. of Technical Control, American Writing Paper Company, Holyoke, who gave a talk on "Standardization of Unit Weights and Moisture Content of Pulp."

Tuesday morning Lieut. Col. B. A. Franklin, vice-president, Strathmore Paper Company, Mittineague, Massachusetts, gave an extended talk on "Value of Local Divisions and Classified Groups," with which he used many charts which were very interesting. At 2:00 p. m. papers from local divisions were read, followed by meetings of the local divisions. At 4:00 p. m. the meetings of the classified groups took place.

Tuesday evening at 7:00 p. m. a dinner was served in the main ballroom of the hotel, after which Mr. R. P. Dryer, C. P. A., of Boston, gave a talk on "Advantages of Co-operative Action," which was followed by another by Mr. F. H. Figsby, C. P. A., of New York.

All these meetings had a goodly attendance, and we are sure that much profit will come out of these men getting together.

The time to prevent an accident is before it happens, says the National Safety Council.

GEORGE F. HARDY

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James L. Carey

Paper Mill Architect and Engineer

208 N. Laramie Ave., Chicago, Ill.

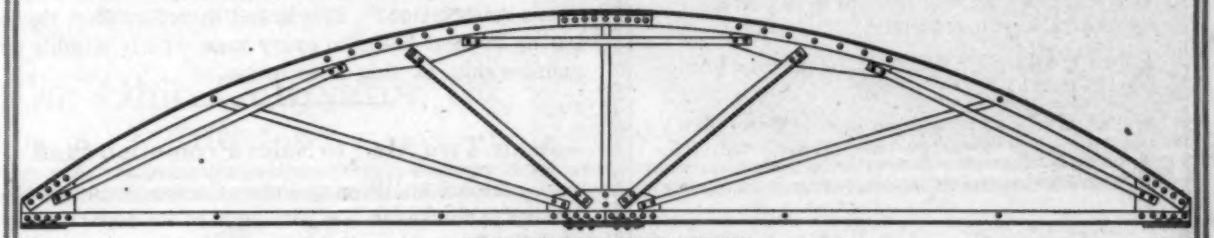
FOR SALE:

2—No. 8 Improved Paper Machinery Co. Save Alls
2—No. 10 Improved Paper Machinery Co. Save Alls
Good condition. Inspection invited.

Diamond State Fibre Co. **Bridgeport, Pa.**

STEEL ROOF TRUSSES

FOR PAPER MILLS, GARAGES, MOVING PICTURE THEATRES, FACTORIES, WAREHOUSES, SKATING RINKS AND SCORES OF OTHER TYPES OF BUILDINGS



GRAVES ECONOMY TRUSS
(Patents Pending)

The truss that reduces your fire risk

Why use wood trusses when you can obtain the Graves Economy Steel Truss at practically the same price? These trusses are light, strong, economical and fire proof, and obstruct very little light. Easily and quickly erected, as they are shipped in completely fabricated form for most sizes, or in two parts for larger sizes.

Prompt Service and Satisfied Customers Is Our Motto

CONTINENTAL BRIDGE CO.

General Sales Office **460 Monadnock Block, Chicago**

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STEBBINS ENGINEERING & MANUFACTURING CO.

WATERTOWN, - NEW YORK

Special Sulphite Mill Equipping

Agents for the Heiskanen Pulp Bleaching Apparatus.

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PAPER, PULP AND FIBRE MILLS INCLUDING BUILDINGS AND COMPLETE MECHANICAL EQUIPMENT
WATER POWER DEVELOPMENT
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GATTI-McQUADE COMPANY

JOSEPH GATTI, *President*

Established 1894 Incorporated 1898

Tell Us Your Problems in

Paper Manufacturers' Supplies

¶ We have the EQUIPMENT to handle any TONNAGE you may desire.

¶ We are in a POSITION to give you the exact GRADE you require.

¶ Our CAREFUL GRADING assures you of UNIFORMITY.

¶ Our SORTING is done under SANITARY conditions in 2 large MODERN WAREHOUSES.

Every Standard Grade of

Rags, Paper Stock

Cotton — **Waste** — *Woolen*

We also carry a full line of

Kraft, Sulphite, Manila and Waterproof Wrapping Papers.

Straw, Binders, Chip, Lined and Coated Box Board.

Cotton, Hemp and Manila Cordage.

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Main Office: 200 Fifth Ave., New York City

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Philadelphia Office: 1416 Wood St.

Salesmen's Association

Mr. Geo. K. Gibson, President of the newly constituted Salesmen's Association of the Paper Industry, in his letter of greetings to the charter members has outlined a number of "problems confronting the individual salesman in our industry which can be rightly solved by the combined wisdom and action of the Association." He urges stress to be laid on efforts to secure new members as the first important thing to do, since it is apparent that a large, compact organization will be able to do things which to a small group would be impossible of accomplishment. The organization started on April 14th with one hundred and eleven members and the slogan is now "five hundred by July 1st."

"Theodore Roosevelt once said, 'Every man owes some of his time to the upbuilding of the profession to which he belongs.' Salesmanship is a profession. Every salesman in the pulp and paper industry owes some of his time and talent to the upbuilding of the industry through active membership in our Salesmen's Association." It is urged therefore that these truths be sent home to every man who is eligible to membership in this association.

Adds Two Men to Sales Promotion Staff

The American Writing Paper Company announces further increases in the personnel of its departments of Sales Promotion, Publicity, and Advertising: Mr. Almon W. Spaulding and Mr. William Robins, both of whom began their duties this week.

Mr. Spaulding is a native of Massachusetts and recently directed the campaign of the Massachusetts Agricultural College which successfully raised $150,000 for the building now being erected as a memorial for forty-nine of the college men who were killed in the war. Before coming with the company Mr. Spaulding gathered experience in the advertising department of one of the large Boston department stores.

Mr. Robins has had much advertising experience with Sperry & Hutchinson, and the "New York Times." For the past few months he has been associated with the O. J. Gude Co., one of the largest advertising agencies in the country.

New Manager at Lincoln Mill

The Lincoln Paper Mills, of Elkhart, Indiana, is to be congratulated on securing the services of Mr. Cyrus E. Frye, as manager and treasurer of this newly enlarged organization. Mr. Frye is so well known throughout the country as a successful operator and manager of book and board mills that it goes without saying the future success of this organization is fully assured. His assistant-manager and sales manager is Mr. Karl Simonton, who has been

Convert Your Salvage Into Dollars & Cents with the FAMOUS Ohio BALING PRESS

THE present paper shortage demands that every pound of paper, card, and boxboard clippings be saved and marketed in the most efficient manner.

Scrap material is worth as much today as new stock was five years ago. Many manufacturers don't realize that today's waste will be tomorrow's profits when business again becomes normal.

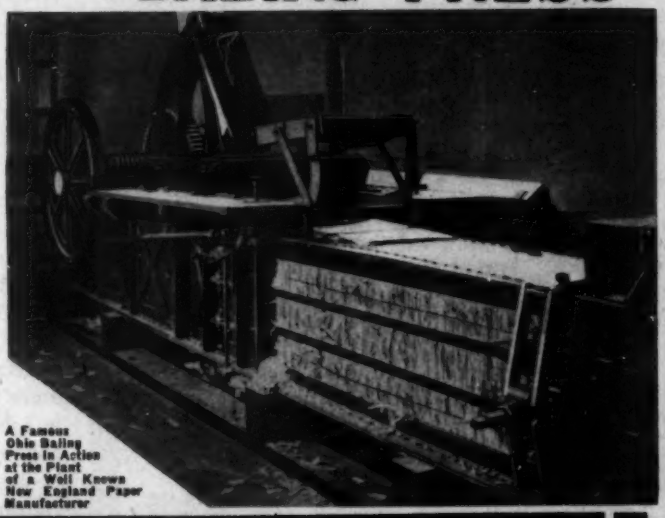
Stop This Waste Now

Buy a Famous Ohio Horizontal Baling Press. It will be one of the best investments you have ever made.

The Famous Ohio is a mechanical masterpiece. It is a giant for strength, a demon for speed, and a continuous duty machine. Write us for further particulars.

The* Ohio Cultivator *Co.

Bellevue, Ohio



A Famous Ohio Baling Press in Action at the Plant of a Well Known New England Paper Manufacturer

FOURDRINIER WIRES

Dandy Rolls *Cylinder Molds*

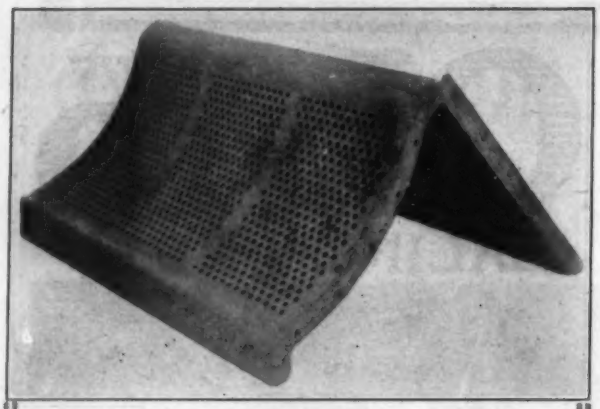
Brass, Copper and Iron Cloth

Bank and Office Railings

WIRE SIGNS

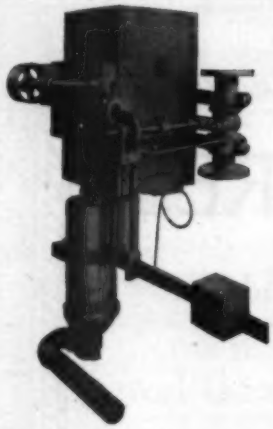
Cheney Bigelow Wire Works

Established 1842 SPRINGFIELD, MASS.



Because there are no moving parts this is a very simple but very efficient device. Patent No. 1,271,426 issued to Mr. Brownell Buehler, July 2nd, 1918.

The Shartle Continuous Beater Company
MIDDLETOWN, OHIO



This is the

Trimbey Automatic Consistency Regulator

REGULATORS that REALLY REGULATE. which will cause stock to be delivered to beaters, mixers or paper machines at a uniform consistency. Something long sought in the paper industry.

M. G. TIBBITTS
Glens Falls, N. Y.

connected with the mill for the past seven years, and is very well known to the jobbing trade throughout the East and middle West. The other newly elected officers of the company are Mr. E. B. Zeigler of Elkhart, president, Mr. Charles C. Colbert, president and manager of the American Coating Mills, Elkhart, vice-president, and Mr. S. B. Monroe of Kalamazoo, secretary.

The company is planning some extensive enlargements and improvements which are to be announced a little later in the year.

New Publications

The hot process water softener is described in a book recently issued by the H. S. B. W.-Cochrane Corporation, formerly the Harrison Safety Boiler Works, of Philadelphia, Pa. The hot process softener is a modern development of the well-known lime-soda process, the difference being that the chemicals are added to the water only after it has been heated to 205° F. or higher, which results in practically instantaneous and complete chemical reactions and in more rapid settlement of the precipitate. The result is a considerable reduction in the time required for the sedimentation so that the apparatus can usually be installed within power plant buildings and without requiring special foundations or housing. The fact that a feed water heater is combined as part of the apparatus also reduces the complication and the expense of piping, etc. It is also claimed that the maximum reduction of scale and sludge-forming matter is obtained with a minimum excess of reagents and that there is no after-precipitation or troublesome deposits of scale and sludge in pumps, piping, feed water heaters and boilers, while due to the reduced solubility of the products in hot alkaline water, the minimum amount of sludge-forming solids enter the boiler and the tendency to priming and foaming is minimized. In the present publication, these statements are supported by scientific data and by the results of practical operation. An improved type of a chemical feeder designed to force the water into the softener against back pressure, and a system of pressure filters, are also described. The closing chapter enumerates the impurities found in boiler feed water. and describes the kinds and amounts of chemicals necessary for their removal. The book will be of value to all who are concerned with the operation of steam boilers.

The Benjamin Electric Mfg. Co., Chicago, has issued Catalog 22, comprising a complete listing, descriptions and illustrations of Benjamin electrical specialties. In addition to the catalog data there is a section devoted to useful information upon illumination requirements and also a chapter setting forth simple rules for laying out lighting plans for the attainment of correct industrial lighting. A numerical

The Meaning of Co-operation

THE word co-operation is from the Latin word *co-operari* meaning "to work with"—and quite apropos the largest part of the word means "to work." This agrees with our experience and is one of the secrets of our success in co-operating with our clients—just work—service. It's the work we do with them or the work we have done (experience) that satisfies them. Ask some of those we have co-operated with —our catalog contains a list.

Swenson Evaporator Co.

Main Office—945 Monadnock Block, Chicago
Eastern Office—318 Widener Bldg., Philadelphia

Bonds—Ledgers Writings

A Grade for Every Requirement

All of the same high standard of value as

SYSTEMS BOND

"The Progressive Left-Hand Paper at the Reasonable Price"

Eastern Manufacturing Company
GENERAL SALES OFFICES
501 Fifth Avenue NEW YORK
Mills at Bangor and Lincoln, Maine

Many Food Products That Would Perish

in the Atmospheric Sea before being sold and consumed are rescued by KVP vegetable parchment and waxed papers. Jump in—the boat's dry!

Kalamazoo Vegetable Parchment Company,
Kalamazoo, Michigan
"World's Model Paper Mill"
Makers of waxed and vegetable parchment paper

Mills Dealers

Get This Information for Your Sales Dept.

The Second Annual
Revised and Enlarged
1920 Edition
of the

Directory and Buyers' Guide

of the

Paper Box and Allied Industries

Is Now Ready

Containing 290 Pages
The Most Reliable List Ever Compiled of
Corrugated & Solid Fibre Container Manufacturers
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Folding Box Manufacturers
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Price: Three Dollars

RAVENSWOOD PRESS PUBLISHING COMPANY
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Sturdi-Truck
ITS ALL IN THE HEAD

"The Supreme Lift Truck"

Lifts With the Handle Held at Any Angle

In almost every Paper and Pulp Mill there are certain crowded places, narrow aisles or cramped corners which put a truckman with an ordinary lift truck at a decided disadvantage.

With a **STURDI-TRUCK** the truckman merely swings the handle around to any convenient angle and the load can then be quickly and easily elevated and drawn away to any desired destination.

This is only one of the many features found on the **STURDI-TRUCK.** It will pay you to investigate its many supreme points.

Make Sure Your Next Lift Truck Is a
STURDI-TRUCK

Send us your name and we will be pleased to mail you further information telling how the **STURDI-TRUCK** can show you a saving.

Sturdi - Truck Manufacturing Co.
Willimansett
HOLYOKE MASS.

index gives full details covering catalog numbers, list prices, package quantities, weights and discount schedules. For convenience the material listed in this catalog is grouped into schedules, with mechanical separators, tabbed for quick reference. The following schedules are listed: Schedule 1, Wireless Clusters and Plug Clusters; Schedule 2, Industrial Lighting Fixtures and Reflectors; Schedule 3, Wiring Devices; Schedule 3H, Attachment Plugs; Schedule 4, Special Fixtures and Fttings; Schedule 6, Industrial Signals; Schedule 8, Panel Boards.

The Jeffrey Manufacturing Co., Columbus, Ohio, has issued their latest catalog No. 259, fully illustrating and describing their Type "E" Swing Hammer Shredder, (ball bearing) for reducing Wood Chips, Bark and other fibrous materials. The new catalog illustrates numerous installations and also contains valuable Engineering Information, Plant Layouts and other data of service to Plant Managers and Superintendents.

Obituary

William Buchanan, founder of the Appleton Wire Works, located at Appleton, Wisconsin, died Tuesday morning, May 11, at his home, 548 College Avenue, of that city, after an illness of more than a year. Mr. Buchanan established the Appleton Wire Works in 1896 after many years of experience in the East. He was one of the best known Fourdrinier wire makers in the United States.

Born in Glasgow, Scotland, 77 years ago, he came to America when five years of age. He began to learn the wire weaving trade with the DeWitt Wire Cloth Company, Belleville, N. J., and had just made a good start when the Civil War broke out. Mr. Buchanan enlisted in the navy, serving until the conclusion of the war. When hostilities ceased, he went back to the DeWitt Company, finished his trade and after a few years organized the Buchanan and Smith Company at Bloomfield, N. J. Later John Eastwood was taken into partnership. That company still exists under the name of the Eastwood Wire Manufacturing Co.

In 1882, Mr. Buchanan went to Springfield, Mass., where he became superintendent of the Cheney-Bigelow Wire Works and remained there until 1896 when he came to Appleton and established the Appleton Wire Works, now one of the largest institutions of its kind in the world.

Mr. Buchanan is survived by his widow; one daughter, Miss Annette Buchanan; two sons, John M. of Ottawa, Can., and Gus E. Buchanan, of Appleton.

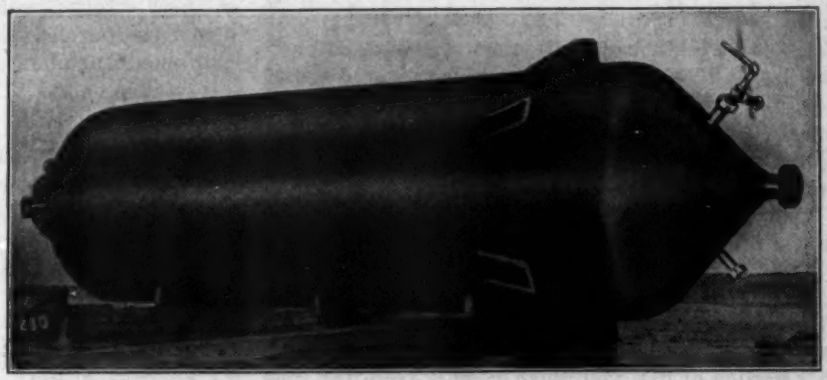
Thou shalt guard thyself with all diligence; this is the first and greatest commandment of Safety First. The second is like unto it, Thou shalt guard thy neighbor as thyself, says the National Safety Council.

Kellogg

Seamless Welded
DIGESTERS
and TANKS
FOR PAPER AND PULP MILLS

We make them of any thickness, diameter or length for paper and pulp mill uses.

WITH your mill running 24 hours per day and still unable to meet all the demands of your customers, a leak in your digesters or tanks means a big loss to you. You will avoid all this trouble if you install Kellogg's Seamless Digesters and Tanks, welded by the Forge and Hammer Process, the strongest weld of any process in existence.



Testing Seamless Hammer Forged Welded Sulphate Digester for Brown Corporation, La Tuque Mill, Quebec.

To the man that is willing to be "shown," just ask us to prove their economy and efficiency. A letter will start the ball-a-rolling.

THE M. W. KELLOGG CO. **140 Cedar Street, New York**

SIMONDS KNIVES

ALL the essential qualities that go to make up an efficient cutting service are found in Simonds celebrated knives for Paper Mills, Pulp Mills and Printers. The steel, the temper and the cutting edge of all Simonds Knives are uniform, and the knife is backed by expert workmanship.

Barker, Chipper, Paper Cutting Knives and Circular Cutters are a few of the edge-holding products which are produced in Simonds Factories.

Write for Prices and Catalog

Simonds Manufacturing Co.

"The Saw Makers"

Fitchburg, Mass. 5 Factories

Chicago, Ill. 12 Branches

Mechanical Soot Blowers in Demand

During the months of January, February and March, 1920, the Diamond Power Specialty Company, Detroit, Mich., received orders to equip a total of 635,200 H.P. of boilers and economizers with mechanical soot blowers. This is believed to constitute an unequalled record in the entire power equipment field. The boilers to be equipped develop as much power as harnessed Niagara. It would take a train of flat cars twelve miles long to hold them.

A notable feature of this immense volume of business is that 70% of the orders received covered equipment for two or more boilers, and that 57.7% were repeat orders. Better than could anything else, these figures show the present day attitude toward the mechanical soot blower, which once was regarded as a luxury, but is now considered to be the most essential of necessities.

There is but one healthy growth of the plant called success. If you want this kind of a rose-bush in your garden of life, you must grow it from the seed of your own right ideas, planted in the garden of your own genius and cultivated by constructive effort to bless the whole world. This is the way to real and lasting success.

At the annual meeting of the stockholders of The Sandy Hill Iron & Brass Works, held May 1, the following directors were elected for the ensuing year: A. J. Kennedy; R. C. Tefft, Jr.; C. W. Kellogg; H. L. Broughton; J. M. Ferris. Following the stockholder's meeting, the directors met and elected the following officers: President, A. J. Kennedy; vice-president, R. C. Tefft, Jr.; secretary and treasurer, J. M. Ferris.

If a man grows in the love and esteem of his own wife, as the years go by, he does not need to care what others think of him. He is very nearly all right. But look out for the man who is always finding fault with his wife, and takes delight in talking about her to others.

The Fibrated Products Corporation, organized for the manufacture of asphalt shingles, roofing and paving materials with general offices at 138 N. La Salle street, Chicago, announces the consummation of a deal with the Charleston Industrial Corporation, an organization that purchased the entire city of Nitro, W. Va., from the United States Government and is rapidly developing it into a large industrial center, whereby the Fibrated Products Corporation has acquired possession of one of the nitro plants, together with extensive tankage and machinery equipment and large ground for future extension.

Announcement is made by Mr. F. W. Davis, Jr., president of the Detroit Graphite Company, of Detroit, that Mr. J. W. Austin has been elected a member of that company with title of assistant secretary. Mr. Austin is well known throughout the paint and varnish industry through his connection with the Acme White Lead and Color Works for which company, during the past fifteen years, he has been general purchasing agent. In addition to other duties in the Detroit Graphite Company, Mr. Austin will direct the purchasing policy for both their Detroit and allied Canadian plants.

The Hills-Curtis Co., of Kalamazoo, Mich., will enter the list of manufacturers of paper mill machinery turning out a line of Jordans beating engines and stuff pumps. This firm has not heretofore manufactured paper mill machinery, but is an old, reliable firm manufacturing saw mill and other types of machinery.

The old slogan "eat, drink and be merry, for tomorrow we die" has considerable more truth in it than before wood alcohol became the national drink.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of The Paper Industry, published monthly at Chicago, Ill., for April, 1920. State of Illinois, County of Cook.

Before me, a notary public, in and for the State and county aforesaid, personally appeared Edward B. Fritz, who, having been duly sworn according to law, deposes and says that he is the owner and publisher of The Paper Industry, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Edward B. Fritz, 501 Monadnock Bldg., Chicago; Editor, A. Scott Dowd, 501 Monadnock Bldg., Chicago; Business Manager, Edward B. Fritz, 501 Monadnock Bldg., Chicago.
2. That the owner is: Edward B. Fritz.
3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.
4. That the two paragraphs next above, giving the names and the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stocks and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.
5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

(Signature of publisher or owner.)
Edward B. Fritz.

Sworn to and subscribed before me this 5th day of April, 1920.
[SEAL.]
Mary G. Allen.

(My commission expires March 19th, 1922.)

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Also other standard and special grades to order

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WE have a selling capacity twice our supply, and are in the market for paper in large volume, and would like to hear from you.

Our competent selling organization has from the beginning always demanded an ever increasing supply. We are at present all sold up and looking around for more, and are now in the market for five thousand tons in several grades.

We would be glad to hear from you what tonnage you can give us during this year. Write us.

Interstate Pulp & Paper Co., Inc.
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The Standard Utility Business Papers and the Most Widely Used Papers in the World

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Machine Finish and Super Calender White and Colored Book

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Converter of Paper Mill Felts into finished Bed Blankets and Auto Robes at the nominal charge of $1.50 per blanket or robe, except press felts, which are $1.75 per blanket or robe.

We cut, wash, renap, bind and pack for reshipment at the above prices in the natural color of felt, and in any quantity for mills or individuals. For dyeing any other color we charge 40 cents per pound extra. dry weight after material is washed.

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ASBESTINE PULP

(Reg. U. S. Pat. Office)

Finest White Color Natural Fiber Retention 90%

Every Way Superior to Clay

Prompt Shipments Guaranteed—Largest Mills in the World

INTERNATIONAL PULP CO., 41 Park Row, New York

Strength continues to be the outstanding characteristic of the paper market. On all sides there are concrete evidences that demand for every kind of paper is far in excess of the available supply, and with such a situation obtaining, there is only one position for prices; namely, on an exceedingly high level. In fact, buyers these days are overlooking matters of price in their anxiety to cover requirements. Prompt delivery is the one thing sought by every consumer of paper, and so long as manufacturers or jobbers can give some assurance of effecting deliveries, almost any price within reasonable bounds can be secured for paper. This condition has been greatly accentuated during the past few weeks by the tie-up of railway transportation resulting from the strike of railroad switchmen and other employes. The freight movement in various parts of the country has been seriously impeded, and there has been an urgent clamor for supplies of paper in the numerous consuming centers. Some new high prices have been established on most every class of paper and board, and present indications are that values will undergo even further enhancement before the remarkable rise in paper prices is definitely checked.

Mills the country over are sold up for months to come. It is a confirmed fact that some manufacturers have contracted for their entire production over the balance of this year, while those who are holding off in making commitments so far ahead are flatly refusing to accept orders further into the future, largely because of the innumerable uncertainties surrounding labor, raw material, transportation, etc. Buyers in consequence are encountering no end of difficulty in effecting arrangements covering future supplies. Those who have failed to place contracts and trusted to obtaining supplies in the open market are in an even worse plight. Very little paper of any sort is being offered for spot shipment and expressly not to transient buyers.

The news print market rules exceedingly firm. There have been sales of spot lows of news in standard rolls at 15.50 cents per pound, and doubtless this price has been exceeded in out of the way cases. Demand for news print is pointed, notwithstanding authoritative reports to the effect that daily newspaper publishers in most of the large cities have agreed to keep out of the spot market, presumably in an effort to bring down prices. Small consumers are anxiously looking for supplies and are meeting the stiff prices quoted when finding available stocks. Indicative of the future of the news print market, it was brought out at the hearing before the Senate investigating committee in Washington a few days ago that it is the intention of the International Paper Company to advance its contract basis on print paper again on July 1 next. If the big company increases its price, which it says it necessarily must do because of the constantly rising cost of production, there is little question other manufacturers will follow its lead and do the same.

Book papers are actively in demand, and prices are strong at further advances. Magazine publishers in the East are so short of paper that they are cutting down the number of copies issued, while during the recent tie-up of railroad transportation, when the movement of paper from mills to consuming points was greatly retarded, publishers in quite a number of cases combined two or more issues into one.

Fine papers are scarce and firm in price. Mills cannot begin to satisfy all the demands made on them and are simply doling out their production as best they can to make it cover as broad a field as possible. Coarse papers are being absorbed up to the full output of manufacturers, and there is a large potential demand remaining unfilled. Tissue papers are in brisk call and quotably strong, as are cover papers of various kinds.

Board prices have scored further advances. Plain chip board is now selling at $105 per ton, probably a record for years past, while news board is being readily marketed at $115 to $120. Wood pulp and test boards are practically out of the market insofar as spot deliveries are concerned.

Weird and Wonderful Taxes

No sane person can deny that we must pay for the war, but a lot of apparently sane persons are nearing violent insanity over methods suggested for squeezing it out of us.

It would seem that the weirdest, wildest and most wonderful scheme is to go back a year or so and tax money that is already made and already spent.

Senator Smoot suggests the following possibilities:

Present excess profits tax	$1,100,000,000
Retail sales 1% tax	1,500,000,000
All sales 1% tax	3,000,000,000
Transactions on exchange 1%	1,000,000,000

Every indication points to some "fast work" along taxation lines at the next session of Congress. In the meantime business hopes that the method settled upon will not make it necessary for each executive to remember what he has had for lunch every day for the last three years.

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(Established 1876)
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Real Service

If you are interested in obtaining real service in purchasing or disposing of paper mill property or equipment, we are exceptionally well qualified for the work.

Our concern has been in the paper mill machinery business for thirty years and has an enviable reputation, and a staff including:

One who has had an experience of thirty years purchasing, selling and dismantling paper mills and paper mill machinery, and who is acquainted with a majority of the mills of the country;

One who is a Technology graduate, has had ten years' experience in some of the best paper mills and who was superintendent of a high grade mill for five years;

Two Technology graduates with engineering training.

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175 Richdale Avenue, Cambridge, Mass.

We Can Still Offer

A 20-Ton and a 50-Ton Board Mill, also Two 6-Ton Bogus, Straw or Tissue Mills, 10-Ton Felt, Corrugated or Sheathing Mill, 10-Ton Tissue Mill, also Three Fibre, Binders' or Leather Board Mills, 4-Ton, 5-Ton or 8-Ton production, Textile and Colored Specialty Mill, 6-Ton production. We also can offer re-built Pusey & Jones 68-in. trim Board Machine. Delivery September. Exceptional opportunity.

Gibbs-Brower Co.

Paper and Pulp Mill Brokers

No. 261 Broadway, New York City
Telephone: Barclay 8020

OUR MOTTO: "Service First."

Papermaking Rags

Business of consistently good volume and of a healthy character is passing in papermaking rags and the market is firm of tone. Since shipping conditions have cleared following the strike of railroad workers, buyers have operated in steady fashion and have absorbed comparatively large quantities of rags, the great bulk of which presumably is for direct consumption. That mills are reluctant to buy very far ahead is but logical in view of the present height of prices, yet paper manufacturers are operating their plants on such a scale and are using such large tonnages of raw material that they are kept more or less constantly in the market as buyers.

Dealers assert that thus far this spring receipts of rags from country collection centers have shown but slight increase over winter months, thus contending that their predictions that collections would be light this year are being realized. Much emphasis is placed on the high cost of clothing and the resultant economy the public is obliged to practice in purchasing new garments, and the opinion is common among the rag producing trade that there will be no surplus of stock for some time, provided, of course, if paper mills continue to consume rags at their prevailing rate. Prices throughout the list show but little alteration and such changes as have developed have been mostly toward higher levels. Quotations f. o. b. shipping points follow:

New Stock—	New York and Chicago.
White shirt cuttings, No. 1	19.00-19.50
White shirt cuttings, No. 2	13.00-13.50
Fancy shirt cuttings	12.00-12.50
Washables, No. 1	10.25-10.50
Unbleached muslins	15.50-16.00
White lawns	17.00-17.50
Overall cuttings, blue	12.50-13.00
Black silesias	7.50- 8.00
Old Stock—	
Whites, No. 1 repacked	12.00-13.00
Whites, No. 2 repacked	7.50- 8.00
Whites, house soiled	4.25- 4.50
Whites, street soiled	4.00- 4.25
Thirds and blues, repacked	4.75- 5.00
Thirds and blues, rough	4.00- 4.25
Black stockings	4.60- 4.80
Lace curtains	9.25- 9.50
Cotton canvas, No. 1	5.50- 6.00
White cotton batting	5.25- 5.50
Roofing, No. 1	3.50- 3.60
Roofing, No. 2	3.40- 3.50

Rope and Bagging

Further sharp advances have been scored by prices on old manila rope, sales of No. 1 domestic having been recorded at as high as 9 cents per pound at shipping points and of foreign rope of No. 1 quality at 8.50 cents. Demand is of broad volume and practically all the rope offered is being quickly absorbed by mills notwithstanding the arrival of good-sized shipments from foreign sources. The fact that the English market for manila rope is rapidly advancing is a strong argument for dealers and importers here, who claim to be unable to secure additional supplies on the other side at prices at which they have sold recent lots. The bagging market is the quietest branch of the papermakers' material trade and No. 1 scrap is freely available at 3.25 to 3.50 cents a pound at shipping points. Prices are:

	New York and Chicago.
Gunny, No. 1 domestic	3.40-3.60
Gunny, No. 1 foreign	3.40-3.60
Scrap bagging, No. 1	3.25-3.50
Roofing Bagging	2.75-3.00
Wool tares, heavy	3.75-4.00
Wool tares, light	3.50-3.75
Manila rope, No. 1 foreign	8.25-8.50
Manila rope, No. 1 domestic	8.50-9.00
Sisal strings	3.40-3.60
Mixed strings	3.10-3.25

Old Papers

The waste paper market suffered to no little extent during the recent tie-up of railroad transportation when business was brought nearly to a complete halt, but since the lifting of embargoes and an all-round improvement in freight conditions, mills have been active buyers and quotations now exhibit an upward tendency. The strong position of wood pulp is a bullish factor for old papers and mills are reported substituting paper stock for pulp whenever they can do so. Dealers maintain that the loss of production during the freight tie-up, when supplies could not be shipped and therefore were not collected but burned, is likely to cause prices to go to higher levels should demand undergo much more expansion. At the same time, all realize that prices are on unprecedented heights and that too high values would make for an unhealthy market.

Two exceptionally strong items are white blank news, which has sold at as much as 4.25 cents per pound, and overissue newspapers, which are fetching around 2.25 cents. Shavings are quotably firm at

Main Paper Stock Co.
Incorporated
PACKERS OF WASTE PAPER STOCK
Old and New Rags, Bagging, Strings, Etc.
Importers—Exporters
Daily Capacity 300 Tons
Branches: 331 Pearl Street, 433 East 132nd St.
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Boston (Mass.) Office— 10 High St.
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200 FIFTH AVENUE
NEW YORK
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PAPER MAKERS' SUPPLIES
COTTON, JUTE AND FLAX WASTES
COTTON BAGGING MATERIALS
EAST INDIA MERCHANDISE

FRANCIS HUGHES COMPANY
Paper Mill Supplies
CORRESPONDENCE SOLICITED
Private Switch on C. B. & Q. Tracks
21st Street at Loomis
CHICAGO, ILLINOIS

6.25 to 6.50 cents at shipping points for No. 1 hard whites and 5.25 to 5.50 cents for No. 1 soft white shavings. Board manufacturers are buying low grades in large volume and at steady prices. Quotations f. o. b. shipping points are:

	New York and Chicago.
Hard white shavings, No. 1	6.25-6.50
Hard white shavings, No. 2-3	5.00-5.75
Soft white shavings	5.25-5.50
Colored shavings	2.25-2.50
Heavy book, No. 1	3.25-3.50
Crumpled, No. 1	2.85-3.00
Ledger stock	3.50-3.75
Kraft, No. 1	3.40-3.60
Manilas, No. 1	2.00-2.15
White blank news	4.00-4.25
Overissue news, No. 1	2.15-2.25
Folded news	1.75-1.85
Mill wrappers	1.80-1.90
Box board cuttings	1.60-1.70
Mixed paper, No. 1	1.50-1.60
Common paper	.90-1.00

Chemical Pulp

Under a pressing demand from consuming sources and a lack of available supplies to satisfy the wants of buyers, prices on chemical wood pulp have advanced by leaps and bounds during the past few weeks. Paper manufacturers, in their anxiety to cover requirements, have paid prices probably never before realized on pulp, and present indications are that values are likely to reach new heights before the upward movement of the market is checked. Sales of domestic sulphite of news print quality have been recorded at 7 cents a pound, while bleached sulphite has fetched 9 cents and more and kraft pulp 6.75 cents. Some grades, notably soda pulp, Mitscherlich sulphite and first quality bleached sulphite, are virtually not to be had at present either for prompt delivery or for shipments for some months. For that matter, offerings of all pulps are at a minimum; producers being sold out for a long time ahead. The following prices are mainly nominal:

Bleached sulphite	9.00-
Easy bleaching sulphite	8.00-8.50
News grade sulphite	6.50-7.00
Soda pulp, bleached	8.00-8.50
Mitscherlich unbleached	8.50-9.00
Kraft, No. 1	6.50-6.75
Screenings, refined	2.50-2.75

Mechanical Pulp

The prevailing demand for mechanical wood pulp is far in excess of available supplies and concerted efforts of buyers to locate pulp have promoted an advance that has carried prices to record-breaking levels. Actual sales of spot lots of spruce ground wood of prime quality have been noted at $110 per

Nilsen Rantoul & Co.
Incorporated

Wood Pulp Merchants

Announce the removal of their offices to

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ENGLISH *and* DOMESTIC
for every purpose

The
JOHN W. HIGMAN COMPANY, Inc.
29 Broadway New York, N. Y.
Western Representative: CALE B. FORSYTHE
KALAMAZOO, MICHIGAN

"WANTED—Chemist and Chemical Engineer. Must have had practical paper mill experience. Good opportunity and future for right man. Give references and experience. All communications strictly confidential."

Nekoosa-Edwards Paper Company
Per John E. Alexander

Wanted

PAPER MILL MACHINERY ENGINEER AND DESIGNER by old and well established Central Michigan Machine and Foundry Organization, not now making Paper Mill Machinery. Must be competent and capable of handling all ends of Paper Mill Machinery business. We are particularly desirous of bringing out a line of Jordans, Beaters, and Stuff Pumps. State fully experience, age and salary wanted in first letter. Also furnish references. All applications will be treated confidentially. Address Box 10, Care the Paper Industry.

REMOVAL NOTICE

WE HAVE MOVED TO MORE COMMODIOUS QUARTERS ON THE THIRD FLOOR OF THE MONADNOCK BLOCK, IN THE SAME BUILDING WHERE WE HAVE HAD OUR OFFICES FOR THE PAST YEAR. OUR NEW OFFICES NOW OCCUPY ROOMS 354-359, AND THE PROPER ADDRESS IS 356 MONADNOCK BLOCK, WHERE WE WILL BE GLAD TO WELCOME ANY OF OUR FRIENDS AND ALL THOSE WHOSE GREATEST INTEREST IS THE BETTERMENT OF THIS GREAT INDUSTRY.

The PAPER INDUSTRY

WANTED

Thoroughly experienced storekeeper for pulp and paper mill in Northern Ontario. Must be conversant with paper and pulp machinery parts. Reply giving details of training, experience, salary expected. Also send small photo. Address Box 15, The Paper Industry.

Foreign and Domestic

PATENTS AND TRADEMARKS

PATENT LITIGATION

Infringements, Titles, Searches. WE SPECIALIZE IN PATENTS RELATING TO THE PAPER MAKING INDUSTRY. All members of our firm are Law School graduates and have had more than 10 years' Patent experience.

Black, Oleson, Allen and Thorne

Patent Attorneys

154 W. Wisconsin Ave., Neenah, Wis.

2nd Nat. Bank Bldg., Washington, D. C.

ton at grinding plants and there have been rumors of still higher figures paid. Practically no supply is being offered in the open market for the reason that grinders are sold up to a point as far as they care to commit themselves and that such surplus parcels as become available from time to time are quickly absorbed by regular customers before sellers have time to test out transient buyers. News print and board manufacturers are of course the heaviest buyers, but demand from other sources is relatively as pressing as from these consumers. There is no doubting that a much larger business could be easily accomplished if producers had the pulp to dispose of.

Chemicals

Papermakers' chemicals of all kinds are in active demand and prices are on the rise. Bleaching materials in particular are sought and consumers are freely meeting the quotations named in absorbing supplies. Export demand is proving quite a market factor, and producers in common are operating on as broad a scale as they are able. Current prices are as follows:

Alum, lump ammonia	4.25- 4.50
Alum, lump starch	8.50- 9.00
Alum, powdered	4.75- 5.00
Blanc fixe, powdered	4.50- 5.00
Bleaching powder (domestic drums)	3.50- 4.00
Brimstone (ton)	18.00-20.00
Casein	14.00-16.00
Caustic soda, spot delivery	6.50- 7.00
China clay, domestic, washed	10.00-12.00
China, clay, foreign	18.00-24.00
Rosin, grade E	18.60-
Satin white	2.25- 2.50
Soda ash, 58 per cent light (bags)	3.00- 3.50
Sulphite of alumina, commercial grade	2.00- 2.50
Starch, Globe, in bags	5.97-
Talc (ton)	15.00-16.00

The Eastern Manufacturing Co. with Orono Pulp & Paper Co., of Bangor, Maine, have just closed a 15-year permit for approximately 900,000 cords of pulp wood with the Passamaquoddy Land Co. which has recently purchased the H. F. Eaton lands on the St. Croix river and Grand Lake region in Maine. Of this wood the Eastern Manufacturing Co. has bought two-thirds and the Orono Pulp Co. one-third. The contract price for this wood is considered to be extremely favorable to the pulp companies and means a still further increase of the Eastern Manufacturing Co.'s quite unique pulp wood supply.

E. Salomon, president of A. Salomon, Inc., importers of paper mill supplies, of 15 Park Row, New York, recently returned from a three months' business trip to Europe.

BATHURST LUMBER COMPANY, LIMITED

PRICE & PIERCE, LTD.
30 East 42nd Street, NEW YORK CITY

ARE NOW THE

SOLE SELLING AGENTS
for Bathurst Pulp

Unbleached Sulphite 50 tons daily
Kraft Pulp 50 tons daily

Our pulp is made from Canadian Spruce
We ship in sheets, baled

BATHURST, NEW BRUNSWICK, CANADA

¶ Are you receiving all the Clay you need and the grade that you want? Or are you accepting any old grade just so long as you can get delivery.

¶ Our customers are receiving the same grade as usual and do not even know there is a shortage.

¶ We are in a position to give this same Service to you on

Washed Clay

Because—

QUANTITY: Largest production in United States.
QUALITY: Lowest grit and moisture contents of any clay, domestic or foreign.
DELIVERIES: Reserve stock always on hand.
PLANTS: Three huge plants at McIntyre, Ga., under direct control of Edgar Bros. Co., also Saylorsburg, Pa., and Gordon, Ga.
CRUDE CLAY: Paragon and Excelsior Brands.

MINER-EDGAR CO.
30 Church St. New York

BERMINGHAM
& PROSSER CO.
Kalamazoo, Michigan

PAPER
Distributors

Let us submit an estimate on your next
Catalog
Booklet
Broadside
or Magazine

WOLVERINE
Paper Company

"Wolverine" Waxed Papers for Every Requirement

Best Quality

Waxed Tissue a Specialty

OTSEGO, MICHIGAN

Bardeen Paper Co.
Otsego, Mich.

Printing Papers of Merit

For LETTERPRESS, OFFSET *and* LITHOGRAPHIC PRINTING

Offset Blanks Offset Bristols

Porcelain, Peninsular and Purity Enamel Book

M.F. and S&SC Book and Catalog

English Finish Opaque

Coated Blanks
Post Card Translucent

MAKE THE HANDLING OF
Parchment
Profitable to You

¶We have prepared Samples, put up in neat cartons, for the Jobbing Trade.

¶If you have not received a set we will gladly send one.

ALSO
Special Price Lists
FOR YOUR SALESMEN

SUTHERLAND PAPER CO.
Makers of
Pure Vegetable Parchment
KALAMAZOO MICHIGAN

New Papers

Writing—	
White rag	22-40
White sulphite, No. 1	14-20
Colored	16-25
Ledger—	
White rag	22-44
White sulphite	16-22
Colored sulphite	18-
Colored rag	24-
Bonds—	
White rag	19-50
White sulphite	15-25
Colored sulphite	16-28
Colored rag	19-52
Book—	
No. 1 S. & S. C	11.50-13.00
Machine finished	11.00-12.00
English finished	13.00-15.00
Coated and enameled	15.00-17.00
Lithograph, M. F	17.00-18.00
News Print—	
Rolls, contract	5.00- 5.50
Rolls, transient	12.00-
Sheets	Nominal
Side runs	7.00-
Cover Stock—	
Coated, both sides	12.25-
Coated, one side	12.20-
Wrappings—	
No. 1 kraft	10.50-11.00
No. 2 kraft	10.00-10.50
Boards—	New York and Chicago
Solid news	115.00-120.00
Straw	95.00-100.00
Plain chip	100.00-105.00
White coated chip	115.00-126.00
Manila coated chip	110.00-115.00
Binders board	120.00-130.00

Arthur Smalley, co-partner of Edwin Butterworth & Co., who was in charge of their office at Manchester, England, died recently on board the steamer Kaiserin Auguste Victoria en route to the United States. Mr. Smalley was born in England and first became associated with the paper mill supply trade in the office of Edwin Butterworth 45 years ago. He was 69 years of age and was widely known among American paper manufacturers, having frequently visited this country.

News Personals

Lasher & Lathrop, Inc., one of the leading paper jobbing firms in New York, has increased its capital from $65,000 to $480,000.

The Canfield Paper Company, Inc., paper dealers of New York, has increased its capitalization from $150,000 to $500,000.

Hans Lagerloef, president of the Lagerloef Trading Company, Inc., of 18 East Forty-first street, New York, recently returned from a business trip to Europe, where he made a study of pulp market conditions in Finland. Mr. Lagerloef says that there is a favorable outlook for our receiving fairly large supplies of wood pulp on favorable terms from Finland.

The Hercules Paper Corporation, of New York, has moved into more commodious offices at 135 Broadway, that city. The extraordinary expansion of the company's business made it imperative that larger offices be obtained.

Daniel M. Hicks, Inc., dealers in and importers of papermakers' supplies, of 200 Fifth avenue, New York, has increased its capital from $25,000 to $100,000.

A new paper concern known as the Paper Converting Corporation has been organized in New York by M. A. Wertheimer, G. F. Losche and E. B. Hallett and incorporated under New York state laws with a capital of $1,000,000.

Arthur V. R. Thompson, formerly with the Interstate Pulp & Paper Company, of New York, and Willis D. Cronkhite, formerly with the Dill & Collins Company and Clement & Stockwell, also of New York, have formed a new company incorporated under the title of Arthur V. R. Thompson & Co. for the transaction of a general paper business. Offices have been established at 501 Fifth avenue, New York. The company will represent a number of paper mills in the metropolitan district, selling to printers, publishers and manufacturers.

The H. P. Andrews Paper Company, of New York, has been reorganized. The corporation will carry on business in the future with a capitalization of $20,000 and 2,000 shares of common stock of no par value.

J. ANDERSEN & CO.

FREDERICK BERTUCH, SPECIAL PARTNER
21 East 40th Street, New York City

Importers of Chemical Pulps
BLEACHED AND UNBLEACHED

Agents for Kellner Partington Paper Pulp Co., Ltd.
Sarpsborg, Norway; Forshaga, and Edsvalla, Sweden;
Bergvik and Ala Nya Aktiebolag, Söderham, Sweden

Hart Trading Co. Inc.

Tribune Building, New York

PAPER MILL AGENTS

EXPORTERS and IMPORTERS

PAPER PULP

BRANCH OFFICES
Chicago *Rio de Janeiro* *Buenos Aires* • *Valparaiso*

30 Years Exporting American Paper

Our Markets: The World outside of U. S. A. and Canada.

Our Organization: Ten selling offices, besides salaried travellers and local representatives.

Our Demand: An established clientele, constantly being increased, by an aggressive sales policy.

Our Supply: Your Mill?

Present conditions in America are temporary.

Have you considered what a first-class export outlet would mean to you, with its assurance of steady demand?

Parsons Trading Company

17 Battery Place NEW YORK

London
Stockholm
Sydney
Melbourne
Wellington
Bombay
Mexico, D. F.
Havana
Buenos Aires
Rio de Janeiro

Premier Shipping Co.

INCORPORATED

32 Broadway, New York

Freight Contractors
AND
Forwarding Agents
Customs Brokers

Specializing in Handling of Export and Import Shipments of Paper

Members of
Steamship Freight Brokers' Assn. of the Port of New York
Produce Exchange, N. Y.
Maritime Exchange
Swedish Chamber of Commerce

AMERICAN TRANSMARINE CO., INC.

13 PARK ROW

Formerly HAMILTON & HANSELL, INC.

Exporters and Importers

PAPER and WOOD PULP

RYDÖ STRONG SWEDISH UNBLEACHED SULPHITE
IN STOCK

Export Only

All Grades of
PAPER
and
BOARDS

A. M. Capen's Sons
Incorporated
60 Pearl Street
New York City

Established 1870

Chemical Pulp

Further sharp advances have occurred in foreign wood pulp prices and the uptrend of values shows no signs of having yet been checked. Demand in Europe is of a volume that Scandinavian manufacturers are distinctly unable to satisfy with their present curtailed production, and the result is that prices are soaring to levels probably never before touched. American importers say they are experiencing difficulty in locating available supplies on the other side even when consumers here are willing to meet the stiff figures quoted, and the aggregate tonnage of pulp coming to the United States from Scandinavia is of small volume and is almost entirely sold before it is landed. There are still a few limited-sized lots of kraft and No. 2 quality unbleached sulphite held unsold on the docks scattered at several Atlantic seaports, and these supplies are held at high prices; otherwise there is virtually no spot pulp offered. Prices are mainly nominal and those appended should be so viewed. Receipts at New York during April and nominal quotations follow:

Bleached sulphite	$12.00-
Unbleached sulphite, No. 1	9.00- 9.50
Easy bleaching	10.00-10.50
Mitscherlich unbleached	9.50-10.00
Kraft	7.00- 7.50

E. M. Sergeant & Co., 1,200 bls. from Copenhagen, 175 bls. from Gothenburg; New York Overseas Co., 800 bls. from Copenhagen; J. Andersen & Co., 3,375 bls. from Copenhagen; Scandinavian-American Trading Co., 1,500 bls. from Norrkoping; National Bank of Commerce, 1,900 bls. from Gothenburg; D. C. Andrews & Co., 1,451 bls. from Rotterdam; Brown Bros. & Co., 2,500 bls. from Hamburg; Tidewater Paper Mills, 1,856 bls. and 1,090 tons from Liverpool, N. S.

Paper Stock

Foreign papermaking rags continue to arrive in extensive quantities in spite of reports to the effect that a decided shortage is developing in many parts of Europe and that prices there are rising at a rapid rate. So scarce are rags in some European countries that paper manufacturers are appealing to their respective governments to place restrictions on the exportation of rag stock, and New York importers recently returned from the other side state that the probabilities are the movement of rags from Europe to the United States will diminish during forthcoming months. Fair amounts of rope and bagging and miscellaneous paper stock are coming in, and importers in common report having little trouble in marketing all the material they have to offer among paper mills. Arrivals at New York in April follow:

Old Rope

Irving National Bank, 122 bls. from Copenhagen, 9 bls. from Leith; Maurice O'Meara Co., 7 bls. from Manchester; Old Colony Trust Co. of Boston, 465 bls. from Havre, 95 coils from Hull, 48 coils from Bristol; J. Oppenheimer & Co., 50 bls. from Bordeaux; Ladenburg, Thalman & Co., 250 bls. from Hull, 47 bls. from Rouen, 79 bls. from Gothenburg; International Purchasing Co., 1,267 coils from Hull, 1,121 coils from Bristol, 101 bls. from Havre, 92 bls. from Rotterdam, 402 bls. from Antwerp, 72 bls. from Leith; E. J. Keller Co., 137 bls. from Hull; Equitable Trust Co., 217 bls. from Hull, 138 coils from Marseilles, 9 bls. from Antwerp; Edwin Butterworth & Co., 26 bls. from Hull, 80 bls. from Marseilles; Citizens National Bank, 97 coils from Hull; American Express Co., 85 coils from Antwerp; First National Bank of Boston, 443 coils from London; Order, 107 bls. from Stockholm, 66 coils from Belfast, 40 bls. from Hull, 203 bls. from Havre.

Old Bagging

Irving National Bank, 113 bls. from Copenhagen, 39 bls. from Southampton, 190 bls. from Antwerp; Mechanics & Metals National Bank, 59 bls. from Manchester, 197 bls. from Liverpool; International Banking Corp., 9 bls. from Manchester; W. Schall & Co., 312 bls. from Havre; Standard Bank of South Africa, 82 bls. from Havre; National City Bank, 198 bls. from Havre, 102 bls. from Antwerp; Citizens National Bank, 69 bls. from Havre; Ladenburg, Thalman & Co., 111 bls. from Hull; Atlantic National Bank, 105 bls. from Bristol, 48 bls. from Hull; Daniel M. Hicks, Inc., 50 bls. from Glasgow; Equitable Trust Co., 154 bls. from Hull; Wilkinson Bros. & Co., 88 bls. from Hull; Bank of New York, 173 bls. from Antwerp; Lavine & Rosenberg, 14 bls. from Liverpool; Castle, Gottheil & Overton, 181 bls. from Antwerp; Brown Bros. & Co., 32 bls. from Antwerp; Guaranty Trust Co., 83 bls. from Antwerp; Order, 305 bls. from Bordeaux, 73 bls. from Leith, 20 bls. from Hull, 86 bls. from Dundee.

Rags

National City Bank, 205 bls. from Copenhagen, 516 bls. from Havre, 235 bls. from Oran, 335 bls. from

The Carthage Machine Company

The Carthage Chipper
BETTER THAN EVER

The Carthage Improved Chip Crusher
AS GOOD AS THE CHIPPER

The NEW Carthage Pulp Shredder
A REMARKABLE PERFORMER
IT DOES WHAT NO OTHER SHREDDER CAN DO

The Carthage Wood Washer
KEEPS DIRT OUT OF YOUR SHEET

The Carthage Ball Bearing Straightway Blow Valve
IT IS VERY DURABLE IT IS EASY TO HANDLE

Barkers	Pumps	Wet Machines
Wood Splitters	Chip Screens	Plug Machines
Pulp Grinders	Sulphur Burners	Bronze and Lead Work

The Carthage Machine Company

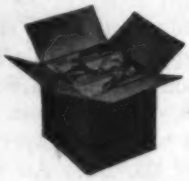
Carthage New York

SAMUEL M. LANGSTON COMPANY

CAMDEN, N. J., U. S. A.

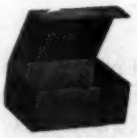
Paper Can Machinery

Complete sets of machinery for making cans such as are used for packing oats, coffee, baking powder, tobacco, snuff and cleansing powder.



Corrugated Paper Shipping Case Machinery

We build all the machinery necessary for the installation of complete plants.



Paper Slitting and Rewinding Machines

Machines for cutting and rewinding roll paper. We build all width machines to handle any weight or thickness paper and any size roll.

Rouen, 1,871 bls. from Antwerp, 294 bls. from Hull, 11 bls. from Liverpool; Irving National Bank, 190 bls. from Copenhagen, 270 bls. from Hull, 160 bls. from Antwerp; Equitable Trust Co., 1,055 bls. from Havre, 48 bls. from Manchester, 137 bls. from Rouen, 679 bls. from Hull, 477 bls. from Antwerp; American Foreign Banking Corp., 88 bls. from Havre, 236 bls. from Hull, 452 bls. from Antwerp; Citizens National Bank, 391 bls. from Hull, 103 bls. from Havre; Foreign Trade Banking Corp., 16 bls. from Glasgow, 2,049 bls. from Antwerp; International Banking Corp., 170 bls. from Rouen, 255 bls. from Hull, 80 bls. from Antwerp; Guaranty Trust Co., 149 bls. from Glasgow, 573 bls. from Antwerp, 1,306 bls. from Hull, 1,084 bls. from London; Standard Bank of South Africa, 77 bls. from Hull, 15 bls. from Antwerp; Bank of New York, 23 bls. from Havre, 2,398 bls. from Antwerp; New Netherland Bank, 154 bls. from Havre, 2,147 bls. from Antwerp; First National Bank of Boston, 453 bls. from Antwerp; Kidder, Peabody & Co., 423 bls. from Havre, 43 bls. from Rouen; Brown Bros. & Co., 158 bls. from Havre, 75 bls. from Bordeaux, 2,430 bls. from Antwerp; Goldman, Sachs & Co., 333 bls. from Bordeaux, 231 bls. from Hull, 676 bls. from Antwerp, 497 bls. from Havre; R. F. Downing & Co., 1,188 bls. from Barcelona, 702 bls. from Antwerp, 134 bls. from Hull; Ladenburg, Thalman & Co., 606 bls. from Rouen, 389 bls. from Antwerp, 634 bls. from Havre, 199 bls. from Hull; Heidelbach, Ickelheimer & Co., 106 bls. from Antwerp; Hollingsworth & Vose Co., 35 bls. from Barcelona; Smith Paper Co., 33 bls. from Hull; Patent Vulcanite Roofing Co., 1,242 bls. from Antwerp; W. Schall & Co., 691 bls. from Havre, 238 bls. from Antwerp; Credit Comm'l de France, 17 bls. from Hull, 10 bls. from Antwerp; International Purchasing Co., 74 bls. from Havre; Davies, Turner & Co., 209 bls. from Antwerp; Baring Bros. & Co., 1,535 bls. from Antwerp; Dallas Waste Mills, 127 bls. from Antwerp; Albion Trading Co., 178 bls. from Copenhagen, 724 bls. from London; Cummings & Son, 4 bls. from Copenhagen; S. Fenbacher & Co., 24 bls. from St. John's; R. Goldstein & Son, 306 bls. from Havre, 41 bls. from Antwerp; George W. Millar & Co., 78 bls. from Havre, 49 bls. from Antwerp; E. J. Keller Co., 49 bls. from Havre, 610 bls. from Barcelona, 88 bls. from Antwerp, 50 bls. from Genoa; A. Katzenstein, 288 bls. from Havre, 517 bls. from Hull, 164 bls. from Antwerp; Castle, Gottheil & Overton, 312 bls. from Bordeaux, 40 bls. from London, 3 bls. from Hull, 48 bls. from Barcelona, 15 bls. from Antwerp; Wilkinson Bros. & Co., 149 bls. from Hull; Daniel M. Hicks, Inc., 24 bls. from Hull, 103 bls. from Antwerp; E. Naumberg & Co., 23 bls. from Liverpool; Paul Berlowitz, 462 bls. from Rouen, 245 bls. from Antwerp; Conwie Waste Co., 148 bls. from Antwerp; Parsons & Whittemore, 227 bls. from Antwerp; Maurice O'Meara Co., 119 bls. from Antwerp; Gatti-McQuade Co., 226 bls. from Antwerp; E. Gross & Co., 209 bls. from Ant-

SALOMON BROS. & CO.

Importers and Exporters of

Cotton, Cottonwaste, Linters, Ramie, Jute, Rubber

Import of All Grades of Rags and Rope

200 Fifth Ave.. NEW YORK

Largest producers in the world of highest grade Brimstone —guaranteed 99% pure—free of Arsenic and Selenium.

The
UNION SULPHUR COMPANY

In so far as possible we will be glad to offer advice or suggestions to prospective buyers who are using or may be contemplating the use of brimstone.

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NEW YORK

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IMPORTERS-DEALERS
ESTABLISHED 1895

Foreign and Domestic

Rags, Bagging, Rope and Waste Paper

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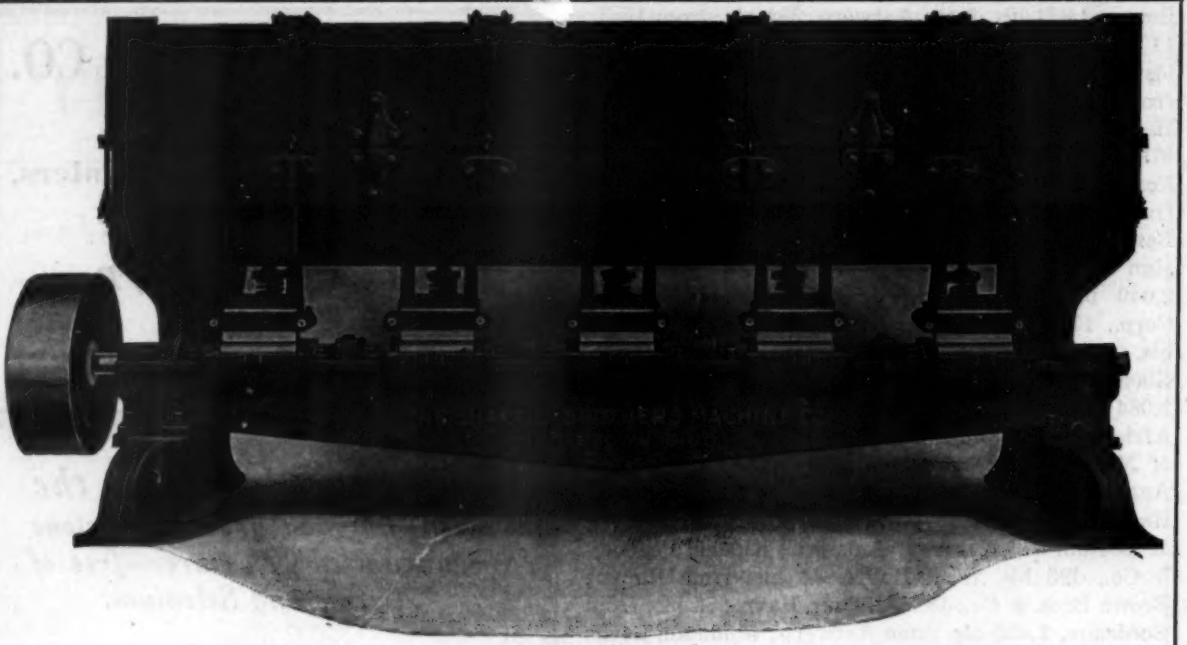

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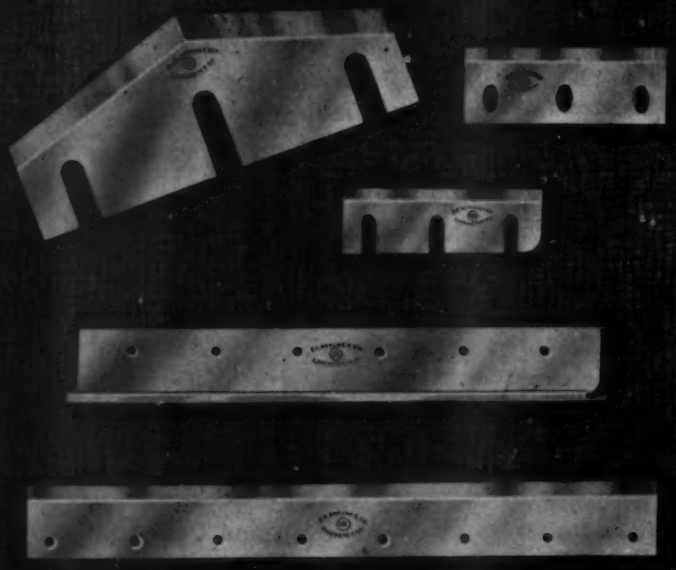

The Demand for Maximum Production

is answered by the superior performance of

Atkins Silver Steel

Barkers, Chippers, Cutters and Planers.

Their excellent material, temper and workmanship assures you of knife satisfaction and we solicit a trial for them.

Write for our Machine Knife Booklet.

E. C. ATKINS & COMPANY, Inc.

Home Office and Factory: INDIANAPOLIS, IND. *Machine Knife Factory:* LANCASTER, N. Y.

werp; Salomon Bros. & Co., 45 bls. from Antwerp, 152 bls. from Hull; W. Hughes & Co., 76 bls. from Antwerp; Royal Mfg. Co., 80 bls. from Antwerp; Edwin Butterworth & Co., 74 bls. from Hull, 198 bls. from Antwerp; H. J. Reed, 78 bls. from Hull; Jebb Bros., 94 bls. from Antwerp; J. Rosenberg, 75 bls. from Hamburg; Middleton & Co., 152 bls. from Antwerp; Old Colony Trust Co. of Boston, 51 bls. from Antwerp; Bank of South America, 34 bls. from Antwerp; American Express Co., 408 bls. from Antwerp; Leshner Paper Stock Co., 167 bls. from Havre; Order, 61 bls. from Gothenburg, 2,734 bls. from Havre, 1,613 bls. from Bordeaux, 140 bls. from London, 1,302 bls. from Rouen, 1,617 bls. from Hull, 4,426 bls. from Antwerp.

Miscellaneous Paper Stock

National City Bank, 36 bls. from Copenhagen, 130 bls. from Barcelona, 176 bls. from Nantes; Equitable Trust Co., 299 bls. from Leith, 13 bls. from Hull, 255 bls. from Glasgow; Foreign Trade Banking Corp., 254 bls. from Hull; Guaranty Trust Co., 208 bls. from Glasgow; Brown Bros. & Co., 58 bls. from Glasgow; International Purchasing Co., 35 lbs. from Nantes; R. F. Downing & Co., 113 bls. from Manchester; Sutherland International Dispatch, 162 bls. from Dundee; Ladenburg, Thalman & Co., 759 bls. from Hull; Castle, Gottheil & Overton, 76 bls. from Manchester, 295 bls. from London; Salomon Bros. & Co., 100 bls. from Manchester; E. J. Keller Co., 59 bls. from Dundee, 126 bls. from Belfast; Maurice O'Meara Co., 1 bl. from Dundee; George W. Millar & Co., 134 bls. from Glasgow; S. Silberman & Co., 107 bls. from Glasgow; W. Hughes & Co., 122 bls. from Dublin, 13 bls. from Liverpool; Order, 681 bls. from Belfast, 44 bls. from Nantes, 48 bls. from Glasgow.

Paper

The bulk of finished paper imported into the United States in April consisted of cigarette and hanging papers from France and England, although the feature of the month's imports was probably the arrival of several fairly large shipments of Swedish news print. Importers are reported bringing in news print from Scandinavia and marketing it among publishers here at good profits despite the high cost of about 12 cents per pound without duty. Arrivals at New York during April were:

Cigarette

Peter J. Schweitzer, 41 cs. from Genoa, 124 cs. from Havre; Liberty Mercantile House, 10 cs. from Constantinople; Surbrug Co., 25 cs. from Havre; Southern Pacific Co., 3 cs. from Havre; American Tobacco Co., 371 cs. from Havre, 800 cs. from Bordeaux; B. F. Teale, 34 cs. from Lisbon; C. Drucklieb, 10 cs. from Havre; Rose & Frank, 12 cs. from Southampton, 72 cs. from Havre; Mallory Steamship Co., 5 cs. from Barcelona; W. R. Grace & Co., 20 cs. from Barcelona;

SIGNODE SYSTEM

Framed Reams, strapped with Signode System

Signode straps insure delivery of framed paper bundles in the same condition they leave the mill. Cheaper than rope. No battered corners. Liberal trial arrangement.

Write for Particulars and Prices

The Signode System, Inc.

564 W. Adams Street CHICAGO, ILL.

We are prepared to deliver promptly in any desired quantity the following:

Auramine	Bismarck Brown
Basic Green	Pulp Colors
Chrysoidine R	Vegetable Tallow
Chrysoidine Y	Casein
Methyl Violet	Soda Ash
Orange	Caustic Soda
Basic News Blue	Bleaching Powder
Stearate of Calcium	Stearate of Alumina

A. Klipstein & Company

644-652 Greenwich St., New York

Philadelphia Boston Providence
Charlotte Chicago Montreal

Waterproof Case Lining

Protects your Shipments from damage by moisture while in storage or transit

NATIONAL DUPLEX

We can supply National Duplex Waterproof Case Lining in either rolls or sheets

TRADE MARK

WE ALSO MAKE WAX PAPERS, ALL WEIGHTS, IN SHEETS OR ROLLS

Write for Samples

National Waterproofing Co. Drexel Bldg. Philadelphia, Pa.

YOUR PRODUCTION!

$$P = \frac{WTS}{600} - B$$

P=Production of salable paper in lbs. per hour.
W=Weight in lbs. of one ream (24 x 36-500).
T=Trim of paper in inches.
S=Speed of machine in feet per minute.
B=Lbs. per hour of paper lost in breaks or made unfit for sale.

Of the factors in the above formula by which you can determine YOUR production, T and W are fixed at predetermined values. But the values of S and B are variable and depend upon the equipment of the machine. Suction Rolls increase S and almost entirely eliminate B. The value of P then becomes much greater. Isn't that what YOU desire?

The Sandusky Foundry & Machine Co.
Sandusky, Ohio

Paper Mill Machinery

The
NOBLE & WOOD MACHINE CO.
HOOSICK FALLS, N. Y.

S. B. Lago, 2 cs. from Barcelona; Maurice O'Meara Co., 20 cs. from Havre; Wilkinson Bros. & Co., 15 cs. from Havre; Guaranty Trust Co., 29 cs. from Marseilles.

Hanging

A. C. Dodman, Jr., 215 bls. from Liverpool; F. J. Emmerich & Co., 38 bls. from Havre; W. H. S. Lloyd & Co., 180 bls. from London; R. F. Downing & Co., 16 bls. from London; American Shipping Co., 3 bls. from London; A. L. Diament & Co., 4 cs. from Havre; Prager Co., 56 cs. from Antwerp; J. H. Thorp & Co., 6 cs. from Havre; Order, 2 cs. from London.

Printing

National City Bank, 2,285 rolls from Stockholm, 540 rolls from Christiania; B. F. Drakenfeld & Co., 36 cs. from Liverpool; New York Oversea Co., 306 rolls from Bergen, 1,817 rolls from Christiania; Guaranty Trust Co., 841 rolls from Stockholm; Order, 132 rolls from Christiania.

Filter

Lunham & Moore, 18 cs. from London.

Wrapping

Blauvelt, Wiley Paper Co., 256 bls. from Glasgow; W. Simmoni, 600 bls. from Genoa; Order, 9,360 bls. from Horta.

Writing

American Shipping Co., 10 cs. from Antwerp; Order, 44 cs. from Horta.

Drawing

Favor, Ruhl & Co., 4 cs. from London; Lunham & Moore, 5 cs. from London.

Miscellaneous

J. Andersen & Co., 4 cs. from Christiania; Hart Trading Co., 6 bls. from Gothenburg; Japan Paper Co., 12 cs. from Havre; J. W. Hampton & Co., 20 cs. from Bordeaux; G. D. Kuyper & Bros., 2 cs. from London; Stegemann Co., 3 cs. from Southampton; Snows, Ltd., 4 cs. from Havre; Knauth, Nachod & Kuhne, 10 cs. from Hamburg; National City Bank, 55 cs. from Hamburg; C. A. Johnson & Co., 15 bls. from Liverpool; Charles F. Hubbs & Co., 76 bls. from Antwerp; H. D. Catty & Co., 2 cs. from Havre; A. Bourgois & Co., 18 cs. from Havre; P. Puttmann, 171 cs. from Antwerp; Phelps Dodge Corp., 3 cs. from Havre; Globe Shipping Co., 6 cs. from Rotterdam; Irving Trust Co., 42 cs. from Hamburg; New York Merchandise Co., 3 cs. from Hamburg; Rose & Frank, 5 cs. from Antwerp; P. C. Zulke, 140 cs. from Antwerp; F. B. Vandergrift & Co., 13 cs. from Antwerp; Maurice O'Meara Co., 11 cs. from Santo Domingo; Order, 16 cs. from London, 4 cs. from Antwerp.

Putting off problems is like brushing off flies.—Douglas Malloch.

We
are
Manufacturers
and
Exporters
of
PAPER
also
Importers
and
Jobbers

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